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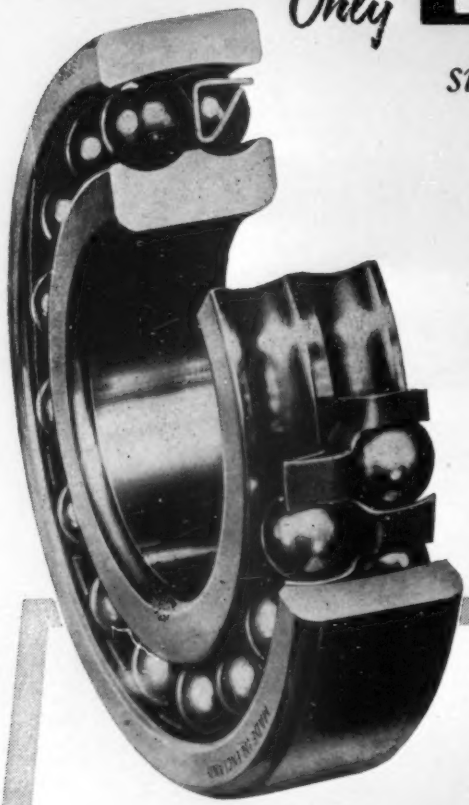

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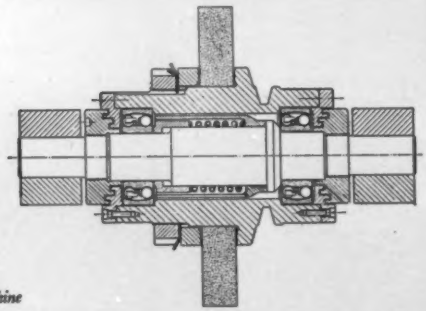

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IRON AND COAL
TRADES REVIEW

Vol. 181 July 29, 1960 No. 4,802

Irreplaceable Asset

IN a recent address the president of the British Coal Exporters' Federation expressed the view that before long Western European industry would be wrestling with the problem of coal shortage, and no longer worrying about dealing with the surpluses which today embarrass nearly all coal-producing countries. He based this opinion on the continued growth of world energy requirements, and the vast expansion of fuel needs created by industrialization and urbanization among all nations.

Curiously, the problem of future fuel supplies attracts much more serious thought and study in the United States than it does in Europe. During Congressional hearings on "Energy Resources and Technology" which took place in Washington last October, the chairman said: "Our concern is primarily with the possibility of shortages and bottlenecks in our resource base and of the risk that energy technology may not keep pace with growth." Other authorities, including some of America's foremost economists and fuel technologists, have issued similar warnings. One has predicted that if the rates of growth established over the last 50 years are maintained much longer, the life expectancy of oil will be a matter of a few decades: another that US demand for oil in 1975 will be more than double the US production.

On this side of the Atlantic the most recent contributions to the study of world fuel supplies and resources have been made by Mr. E. F. Schumacher, economic adviser to the National Coal Board, in a paper, "Coal—the Next 50 Years," prepared for a study conference organized in the spring of this year by the National Union of Mineworkers, and by Mr. H. E. Collins, a member of the National Coal Board, in his paper, "The Importance of National Carbon Deposits," given to the annual conference of the National Association of Colliery Managers at Southport in June. The whole structure of modern industry rests on the natural concentrations of carbon found throughout the world in the form of coal, oil, and natural gas. Those resources are not renewable. The factor of "non-renewability" would possess no particular significance if the reserves were infinitely large. But they are by no means so, and both Mr. Collins and Mr. Schumacher point out the significance of this factor in its influence on economic thought and policy. There is, of course, nuclear fission. Will the need for natural carbons decline and cease altogether owing to the discovery of this new source of energy? Perhaps eventually it will, but neither Mr. Collins nor Mr. Schumacher expects that to happen at all quickly. If all goes well, technically speaking, the displacement of fossil fuels by nuclear energy in 10 years' time may amount to about 1 per cent. of total world use.

If, despite the advances made and promised in nuclear science, the United States sees a risk in the rapid depletion of its fossil fuel resources, what is the risk in Britain? America is marvellously endowed with coal, oil, natural gas, and water power, and, relatively, is scantily populated. Densely populated Britain has no substantial sources of fuel except coal. It follows that we must conserve our resources, and to do that—and this is a point that each of our experts stresses—we must keep our coal industry in being and operate it efficiently. In deciding whether or not to close down this or that colliery we must think of the future, and not only of the economic exigencies of the moment. Logical enough though it may appear, the argument that the best way to conserve the United Kingdom's coal resources is to use the maximum amount of oil, in the place of coal, as long as the oil can be obtained is not realistic, unless the process is carefully controlled. If this substitution of oil for coal is left to so-called "free market forces" it is more likely to lead to the abandonment of reserves than to their preservation, Mr. Schumacher affirms. To allow the industry to shrink now would preserve resources for the 1980s. But while it takes time for the coal industry to shrink, it takes even more time to expand it. Let it run down now and it may not be possible to get more coal when it is wanted. Where are the men to work the pits to come from in the 1980s if the miners' communities are allowed to dissolve in the 1960s? Two assets are needed to get coal, a geological asset—coal reserves, and a sociological asset—a tradition of mining. If we want coal in the 1980s we cannot afford to play havoc with these two assets now, Mr. Schumacher argues.

In his paper to the NUM Mr. Schumacher was stressing the need for a national fuel policy. This is something for which people of all political complexions have called for from time to time over the past few years and it is not the intention here to discuss all over again the arguments that can be adduced for and against such a proposal, except to remark that national policy a mere four years ago seemed to be based on the premise that we were afflicted with a chronic and incurable coal shortage. Mr. Schumacher suggests that all that

is needed at the moment is a modest, reasonable retardation of the change-over to oil. It is his view, presumably, that the slowing down of the coal industry could thus be so controlled that it would bring no danger to the future, and the implication is that it would entail either subsidization of coal production or a tax on oil. Mr. Schumacher is not specific on this point. He calls attention to the fact that this country spends annually some £1,600,000,000 on armaments to preserve itself politically, and suggests that since its economic survival demands that the coal industry be preserved, the extra cost to British industry of a reasonable retardation of the change-over to oil is so minute that it cannot be adduced as an argument.

Different people will have different ideas on that. With the basis of Mr. Schumacher's argument—and the same theme runs through Mr. Collins's paper—few will disagree. It is simply that the resources of natural carbon with which Britain is blessed are not renewable. They represent assets that are likely to be extremely valuable in the years to come. There is, as yet, no substitute for natural carbon as a cheap source of heat and energy. Most of the world's concentrated carbon deposits are coal, but by far the largest part of the increase in world fuel requirements is being met by oil, and the high rate of growth in oil consumption, if continued for a few decades more, must be expected to threaten the world with the early exhaustion of its likely oil reserves. There is as yet no effective substitute for oil products used in internal combustion engines, and it must be assumed that, long before there appear actual signs of oil exhaustion, attempts will be made to limit the use of oil as much as possible to purposes for which no substitute is available.

There is a great probability that in a relatively few years' time, almost certainly before the end of the century, the world's requirements of coal will be substantially higher than they are now, and the availability of concentrated carbon in the form of coal may be an essential condition for the continuance of modern civilization in some countries. Mr. Schumacher is probably right when he says that even the most profitable colliery of today produces very cheap calories compared with the cost of calories likely to be obtained from any "conventional" process in 20 or 30 years' time. If he is correct in this assumption, he adds further weight to his declaration that "Nature's deposits of concentrated carbon are a unique and irreplaceable bounty, a once-for-all endowment of mankind to ease its task of living," and that "no generation has the right to abandon and ruin any of them for the sake of a small, fleeting convenience."

Mr. R. H. E. Thomas to Join RTB?

AN announcement is believed to be imminent that Mr. R. H. E. Thomas, former marketing member of the National Coal Board, has accepted an appointment with Richard Thomas & Baldwins, Limited, the State-owned steel concern.

MR. R. H. E. THOMAS

Mr. Thomas, who had been associated with the NCB since 1947, informed the Minister of Power that he did not wish to be reappointed for another full term when his previous appointment expired in February, but agreed to continue for a further short period. He retired on June 30.

Mr. Thomas, who is 64, founded in 1921 the firm of Milner Thomas & Company, Limited, which later absorbed Peake, Oliver & Peake, Limited, and he served as managing director up to 1946. The following year he became deputy director-general of marketing (commercial operations), and when the Coal Board was reconstituted in 1955, Mr. Thomas became a member with functional responsibilities for marketing and purchasing and stores. He also served as chairman of the Opencast Executive.

He is a director of Benzole Producers, Limited, a member of the British Coking Industry Association, and a past president of the British Tar Confederation, a director of the Coal Industry Housing Association, and of the National Industrial Fuel Efficiency Service. He has been a member of several British distributive organizations, including the Chamber of Coal Traders, and he was vice-chairman of the distributors' section of the London and South Emergency Advisory Committee during the war.

The Coal Board's deputy chairman, Sir Joseph Latham, who for health reasons, informed the Minister that he did not wish to continue after the expiry of his present term of office, has been appointed a director of George Wimpey & Company, Limited, civil engineers, etc., of London, W.6. Sir Joseph leaves the NCB on August 31.

Associated with the coal industry since 1935, Sir Joseph, who is 54, is a chartered accountant. On nationalization he became director-general of finance and served in that capacity up to the reorganization of the board when he was appointed a full-time member. He became deputy chairman the following January (1956). He is chairman of the Coal Industry Housing Association, deputy chairman of the Coal Industry Nominees, Limited, and a director of Benzole Producers, Limited. He was knighted in this year's New Year Honours.

IN CONJUNCTION with Concast, AG, Zürich, Schloemann, AG, Düsseldorf, is to build a vertical continuous casting unit for Dillinger Hüttenwerke. The plant is to provide for the production of slabs up to 60 in. by 8 in., to serve as basic material for the manufacture of plate mill products and strip. The plant is scheduled to go into operation early in 1961.

ISHRA Sells Wesson

PROCEEDS OF £600,000 FROM STEEL RE-ROLLING CONCERN

STEEL re-rolling business of W. Wesson & Company, Limited, Wednesbury (Staffs), which was nationalized in 1951, has been bought back from the Iron and Steel Holding and Realization Agency by Mr. L. J. Wesson and Mr. P. J. Wesson for £600,000. A private company founded in 1914, W. Wesson was valued at the 1951 take-over at £704,838, which was the amount of compensation stock issued under the 1949 Nationalization Act. Members of the Wesson family have remained directors throughout the period of State ownership.

Share capital of the company as taken over by ISHRA was 11,000 10 per cent. £1 cumulative preference shares and 64,060 £1 ordinary. Before the present sale, there was a scrip issue of ordinary raising the amount in issue to £150,000. These 150,000 £1 ordinary shares have been bought by the two Mr. Wessons for £200,000. In addition ISHRA has received a special capital distribution of £400,000 from Wesson & Company's reserves. The transaction therefore represents a capital loss to ISHRA of just over £100,000.

The company has consistently earned profits before tax during its period of nationalization, ranging from £103,000 for 1955-56 to £44,757 in 1956-57, £46,635 in 1957-58, and £66,423 for the latest period, 1958-59. Mr. L. J. Wesson is chairman and managing director of the company, and is also a director of Nuts & Bolts (Darlaston), Limited, and Smethwick Telephone Company, Limited.

United Steel's Senior Management Changes

PRESENT managing director of Unisteel Structural (Pty), Limited, Cape Town, Mr. H. M. Henderson, has been appointed director and general manager of the Workington Iron & Steel Company, branch of the United Steel Companies, Limited. He succeeds Mr. T. S. Kilpatrick who becomes director and general manager of the Steel, Peech & Tozer branch of United Steel. Mr. Henderson will take up his new appointment in November with the intention of relinquishing it in June, 1962.

Mr. T. Sanderson, at present director and general works manager of the Workington Iron & Steel Company, branch of United Steel, has been appointed deputy general manager. Mr. H. Darnell, at present chief engineer, is to succeed Mr. Sanderson as general works manager.

"IN OUR VIEW it would be tragic if this gold mine of limestone deposits was left untouched" said Mr. Archibald Templeton, a member of the Scottish Council (Development and Industry) at a Haddington (East Lothian) inquiry on Tuesday. He was speaking for the Associated Portland Cement Manufacturers, Limited, which has applied for planning permission to establish open-cast working for limestone on 325 acres of agricultural land.

£1,360,000 Orders for Stewarts and Lloyds

MORE than £900,000-worth of seamless steel tubes for a 280-mile oil products pipeline in Iran are to be supplied by Stewarts and Lloyds, Limited. The pipeline is owned by the National Iranian Oil Company and runs from Shahrud to Meshed. It is the second stage of a 516-mile pipeline from Tehran to Meshed for the first half of which Stewarts and Lloyds supplied pipe worth more than £800,000.

The orders were placed by Willbros (Overseas), Limited, a subsidiary of Williams Bros. Company, Tulsa, Oklahoma—one of the largest pipelaying contractors in the world.

Stewarts and Lloyds has also negotiated two Russian orders for a total of 4,750 metric tons of seamless steel tubes, worth about £460,000. This follows the recent completion of an 8,000-ton order for Russia which the company obtained last autumn.

SHIPBUILDERS' £570,000,000 ORDER-BOOK

THE Shipbuilding Conference states that in the second quarter of 1960 British shipbuilders secured contracts for 85 ships of 185,000 tons gross, which brought total orders for the first half of the year to 138 ships of 353,000 tons gross. This compares with 29 ships of 44,000 tons gross ordered in the second quarter of 1959, and 82 ships of 98,000 tons gross during the first half of that year.

At the end of June, 1960, the industry's total order-book stood at 466 ships of 3,780,000 tons gross, of which 61 ships of 731,000 tons gross, of 19.3 per cent., were for foreign owners. The estimated current value of the total order-book is £570,000,000. Improvement in the flow of new work towards the end of 1959 continued until May this year, the conference states, but experience in June, when orders for only 25 ships of just over 20,000 tons were placed and contracts for seven ships were cancelled, was a reminder that prospects for the industry remain uncertain.

STUDENTS studying for the Higher National Diploma in mechanical engineering at Chesterfield College of Technology, who are not employed in industry are to gain their practical experience with engineering companies under a new "sandwich" scheme introduced by the County Education Committee.

Passing Thoughts . . .

BRITISH firms are too often uncompetitive in price, too careless about strict adherence to delivery arrangements, too inclined to favour the home customer and treat the export field as a depository for surplus stock, and too inelastic about their promotion methods. —M. C. W. E. KESSLER, secretary manager of the British Chamber of Commerce for Switzerland, in a letter to The Times.

There can be no incentive to salesmanship while managements persist is seeing a long order-book as a healthy sign of prosperity. Nor can there be planned development while productive capacity is being strangled by inefficient materials control.—Letter in The Guardian.

As sales director of a small engineering firm with a better-than-average record in the export field, I look for government, not talk, from the Prime Minister, *i.e.*, financial inducements to export to help overcome the special costs incurred, promotion of basic industries to overcome supply shortages, and some effort to get management and labour to co-operate more effectively. Give us the financial inducement . . . and watch the exports rise.—Letter in the Birmingham Post.

One of the wisest (and kindest) things the Coal Board did was to stock coal during the recession. That was an acceptance of social responsibility. It saved the country millions of pounds in unemployment pay. That was the least of its benefits. It saved the country from an outburst of industrial ill-will from which no industry would have escaped.—Sheffield Telegraph.

The Coal Masters belonging to the several Collieries of Madeley Wood, Broseley, Dawley, etc., finding themselves obliged to make some Advance in the Price of Coals by reason of the late increase of wages and scarcity of workmen, as well as by the great expense of erecting and maintaining fire engines, and the coals being got deeper, and consequently more chargeable, it is determined and agreed that from the first day of August next to advance one halfpenny per hundred weight on all coals sold at the River Severn from the aforesaid Collieries.—Aris's Birmingham Gazette, July, 1760, quoted in the Birmingham Post.

The National Union of Mineworkers is a pressure group which wields 687,000 conference votes and which thinks that industry should be obliged to buy all the coal that its members dig before anybody should be allowed to import fuel oil. —Economist.

The prosperity of the coal industry as well as the gas industry is very much in the hands of local authorities, and if they make decisions which favour oil they cannot reasonably complain if the prices of competitive fuels—coal, gas, and electricity—have to be increased. —SIR ROBERT NIMMO, chairman of the Scottish Gas Consultative Council.

Can one think of anything more fantastic and irresponsible than the idea of apprentices being persuaded to come out on strike?—Letter to the Birmingham Post.

The blame [for the failure to increase exports to the degree it is considered necessary] rests fairly and squarely upon the shoulders of the Government. . . . Taxation is too high . . . there is still considerable waste by Government departments which private firms would not tolerate. There was the failure to allow depreciation on the lines upon which it was allowed in Germany. . . . Trade agreements were negotiated without the help of experts from manufacturing units. Those responsible would benefit the country greatly by studying the ways of other Governments which are not above consulting those who spend their lives in trade.—MR. FRANK H. HURST, chairman of Samuel Osborn & Company, Limited, Sheffield steelmakers, in a letter to the Sheffield Telegraph.

Actually there is a shortage of trained and experienced export and shipping personnel, but many firms are just not interested in export trade; in fact their policy can be summed up in the sentence: "Oh, we just leave everything to a forwarding agent."—Letter in The Guardian.

SHEFFIELD STEELMAKERS' "AT HOME" AT NEW HEADQUARTERS

THE United Steel Companies, Limited, has been "At Home" this week at its new headquarters, The Mount, Broomhill, Sheffield. A reception was held last Friday when the guests included the deputy Lord Mayor, Ald. A. V. Wolstenholme, the Master Cutler, Mr. P. J. C. Bovill, managing director of Newton, Chambers & Company, Limited, and Dr. J. M. Whittaker, Vice-chancellor of Sheffield University.

The Mount was designed in 1834 by William Flockton, a well-known Sheffield architect, as a block of eight private houses and its pillared façade is now scheduled as of historic interest. The building has undergone extensive internal reconstruction but where it has been found possible and practicable the original character of the building has been preserved. Further accommodation has, therefore, been provided in an entirely new three-storey block and interconnecting wing erected behind the main building.

Law Cases

MINE OFFICIALS CHARGED

Auchengeich Manager and Undermanager Face 10 Counts

THE manager and undermanager of Auchengeich Colliery (Lanarkshire), where 47 miners died in a fire last September, have appeared at Glasgow Sheriff Court on charges under the Mines and Quarries Act. The manager, Mr. James Ford Smellie, and the undermanager, Mr. Alexander Pettigrew, both pleaded Not Guilty to all the charges. The Crown proceedings were initiated three months after the report on the fire was made by Mr. T. A. Rogers, HM Chief Inspector of Mines and Quarries, on April 27 this year.

Mr. Smellie faces seven charges, and Mr. Pettigrew one charge. Both men jointly face another two charges. The charges which Mr. Smellie faces alone are that between June 1 and September 18, he failed to:—Appoint competent persons for the adequate inspection of equipment, namely a booster ventilating fan and its accessories in the main return airway for No. 2 Pit working; appoint competent persons to be in charge, during night shift and back shift, of the machinery driving the fan; ensure that John Clarke, a haulage man on day shift appointed to operate the switchgear when required, and to oil and examine the fan, understood his duties; ensure that a competent person was appointed for the inspection of the main return airway for No. 2 Pit working; secure for immediate use in case of fire (*a*) an adequate water supply, (*b*) sufficient portable fire extinguishers and dust or sand, (*c*) appropriate equipment for conveying the water, dust or sand in case of fire at appropriate places; to have adequate water supplies and efficient means for delivering it at other places in the mine; and to ensure firefighting equipment was regularly inspected and fire extinguishers refilled.

The charge against Mr. Pettigrew alone is that on the day of the mishap, when signs appeared that fire had broken out and 12 men were working in places underground likely to be affected by the outbreak, he failed to cause the men to leave.

Both men are charged that between September 15 and September 18 last year they failed to have the transmission belt of the booster ventilating fan of good construction, adequate strength, and properly maintained; and that between May 1 and September 18 last year they failed to have the booster ventilating fan free from patent defect.

The date of the trial was fixed for December 12.

Truck Used in Factory Need Not be Fenced

PETROL-DRIVEN Lister truck used for carrying materials produced in a factory was not "machinery" to which the Factories Act, 1937, applied and the employers had no statutory duty to fence securely every dangerous part, it was ruled in a case before the Court of Appeal. Their Lordships dismissed an appeal by Mr. Sydney Frank Cherry against a judgment of Mr. Justice Gorman last July in favour of his employers, International Alloys, Limited, Aylesbury (Bucks).

Mr. Cherry, a motor mechanic, while adjusting the oil feed of the truck, injured his hand by coming into contact with the rotating fan of the engine which was guarded, as in an ordinary motor car, by a louvred plate or guard which had to be opened to adjust the oil feed. He claimed damages under section 14 of the Factories Act, 1937, for breach of statutory duty. The defendants claimed that the truck was not "machinery" to which the Act applied.

Lord Justice Sellers said the sole question was whether the truck, which would normally be described as a vehicle, was "machinery" to which the Act applied. There was no definition under the relevant section, and little guidance was available from other sections of the Act. Invited to take the commonsense view, he held that the truck was not machinery.

Lord Justice Devlin, concurring, said he had no doubt that a Lister truck was a machine; but the meaning of the words "any other machinery" must be controlled by consideration of the scope and objects of the Act, which was not to make safety provisions for vehicles which might travel inside or outside the factory, but for machinery inside the factory.

DAMAGES AWARD INCREASED

DAMAGES of £6,750 were awarded in the Court of Appeal to Mrs. Mary Gaittens, for the death at work of her husband, Mr. Daniel Gaittens (41), a steel erector, against his employers, the Motherwell Bridge & Engineering Company, Limited, Motherwell (Lanarkshire). The court allowed with costs her appeal against the award to her of £4,500 by Mr. Justice Donovan at Winchester last July.

Giving judgment, Lord Justice Sellers said there was a possibility that the husband might have earned less after he was 50, through giving up steel erecting. But a charge-hand steel erector had given evidence that Mr. Gaittens had hoped to continue in the trade until he was 60. It was a hazardous occupation, and the wages were high, but even if Mr. Gaittens had given it up, he would have been able to earn £15 a week. The widow, who was 39, at the time of her husband's death, had five children.

CONTRACT for the supply of booster, starting and standby boiler feed pumps for turbo-generators at the "B" power station, Blyth (Northumberland), has been awarded to Sulzer Bros. (London), Limited.

Obituary

MR. E. G. GRACE

THE death has occurred in Bethlehem, Pennsylvania, of Mr. Eugene Gifford Grace, honorary chairman of the Bethlehem Steel Corporation, and one of the most notable figures in American industry.

The son of a New Jersey sea captain turned small shopkeeper, he graduated in 1899 with a degree in electrical engineering and began work with the Bethlehem Steel Company, then only a small organization, as an electric crane operator. Employed later in the steelmaking department, his ability caught the attention of Mr. Charles M. Schwab who, having resigned the presidency of the United States Steel Corporation, in 1905 bought Bethlehem and combined it with other properties to form the present Bethlehem Steel Corporation. Giving Mr. Grace even greater responsibility, he made him in 1913 president of the Bethlehem Steel Company, and three years later president and chairman of the board of Bethlehem Steel Corporation.

Under his direction the Corporation became in both world wars the biggest suppliers of arms and ships to the Allied forces. When he retired in 1957, he had made the corporation the world's second largest steel producer. In 1942 he was awarded the Bessemer Gold Medal of the Iron and Steel Institute.

The death has occurred of Mr. THOMAS SHERWIN, manager of Silver Hill Colliery (Notts) from 1915 to 1925. He was 94.

The death has occurred of Mr. HAROLD ROBERT HARGRAVE, managing director of Alexander Battye (Batteleen), Limited, sheet metal workers, of Leeds. He was 64.

The death occurred suddenly on Saturday of Mr. A. E. DIGGENS, divisional sales manager of Nife Batteries, Limited, Redditch (Worcs). Mr. Diggens, who was responsible for the traction batteries division, had been with Nife for over 30 years.

The death has occurred of Mr. HAROLD J. SMITH, former shipyard manager of John Brown & Company (Shipbuilders), Limited. He was 67. He joined the company as a gateboy and worked as an apprentice plater before entering the drawing office. He became assistant shipyard manager in 1925 and manager in 1950.

Mr. JOSEPH CLARK, National Coal Board safety officer at Hylton Colliery (Co. Durham) has died at the age of 51. Mr. Clark began work and was trained at Elemore Colliery and was later an official at Lyons Colliery, where he obtained his mine manager's certificate.

The death has occurred of Mr. ERNEST JOHN VAUGHAN, a director of Metalcraft (Willenhall), Limited, Willenhall (Staffs). He was 55. Mr. Vaughan started a cycle and radio shop in Willenhall more than 30 years ago, and in 1940 founded the Vaughan Welding Company, Limited, which later became Metalcraft.

The death occurred on Monday of Mr. GEORGE BARRIE, a past president of the Shipbuilding Employers' Federation. He retired in 1953 from the chairmanship of Barclay, Curle & Company, Limited, ship builders, etc., of Glasgow, which he joined in 1908 after serving an apprenticeship with William Denny & Brothers, Limited. He was successively chief draughtsman, general manager, and managing director before becoming chairman in 1945. A member of the Shipbuilding and Advisory Committee and of the council of the Institution of Naval Architects, Mr. Barrie was made a CBE in 1952.

Mr. GAVIN DYET, the 18-year-old son of Mr. A. B. Dyet, manager of Auchincruive 4/5 Colliery (Ayrshire), was killed in an accident at the colliery last week. An apprentice engineer, he was engaged on underground maintenance work with a group of engineers when he was crushed against a wall by some machinery.

The death has occurred of Maj. RICHARD DAVID WILLIAMS, chairman and managing director of E. Thomas & Williams, Limited, manufacturers of miners' lamps, of Aberdare (Glam). He had been associated with the firm for over 50 years, becoming chairman and managing director on the death of his brother, Mr. E. D. Williams, in 1946.

Leading figure in technical education, Mr. ARNOLD W. GIBSON, died on Sunday at the age of 63. He had been principal of the Dudley and Staffordshire Technical College since 1928 and was largely responsible for the college's £100,000 development plan which is due to be completed in two years' time. Before entering the teaching profession Mr. Gibson was a turbine designer with the British Thomson-Houston Company, Limited, Rugby.

Die-casters' £90,000 Extension Scheme at Newport

MANUFACTURERS of stampings, pressings, and die-castings, M. Mole & Son, Limited, Birmingham, announces a £90,000 expansion scheme for its works at Crindau, Newport (Mon). The project, which is to be spread over a period of five years, will add an extra 35,000 sq. ft. of floor space to the works.

The first part of the scheme will be finished on August 8 when a new extension with an area of 9,000 sq. ft. will be completed. Between 12,000 and 14,000 castings will be produced there each day. In 1961 a further 14,000 sq. ft. of floor space will be added, while the final stage, where aluminium castings will be produced, will be completed during the next three years.

Closure of Station May Cause Labour Troubles

RAILWAY station at Llanwern (Mon) is to be closed by British Transport Commission in September. At an inquiry into the proposal last Friday Mr. A. P. Berry, secretary of the Bridge-building and Constructional Engineering Employers' West of England Committee, said that the closure would create the possibility of serious labour troubles at the construction of the nearby Spencer Steelworks of Richard, Thomas & Baldwins, Limited.

The company has supported the closure and there has been no observations from Monmouthshire County Council or Newport County Borough Council.

ALL THE STEEL WIRE ROPE for the new Union Castle liner, Windsor Castle, is to be supplied by R. Hood Haggie & Son, Limited, Birkenhead. The contract involves more than a mile of steel cable, weighing 12 tons.

ECSC Steel Record

OUTPUT RAISED A FIFTH IN FIRST HALF OF 1960

CRUDE steel production in the six member countries of the European Coal and Steel Community amounted in the first half of 1960 to 36,050,000 metric tons, against 29,850,000 tons in the first six months of last year. The rate of increase—20.8 per cent.—is a record since the formation of ECSC. West German production was up to 16,680,000 (13,590,000) tons, an increase of 22.7 per cent., and in France output increased 15.6 per cent. from 7,480,000 tons to 8,650,000 tons.

In Italy output of crude steel increased by 30.3 per cent. from 3,150,000 tons to 4,110,000 tons, and Belgium recorded a rise of 18.6 per cent. from 3,070,000 tons to 3,640,000 tons. Increases of 14.8 per cent. and 19.8 per cent., respectively, were achieved by producers in Luxembourg and Holland.

Output of pig-iron during the period rose by 21.3 per cent. for the Community as a whole, from 22,130,000 metric tons to 26,840,000 tons. Individual percentage increases recorded were Germany 27.9, France 15.1, Belgium 14.5, Luxembourg 11.9, Italy 26.4, and Holland 25.6.

Britain and the Community

Combined production of crude steel in the Community and in Britain in 1959 represented a smaller percentage of world output than the total in 1958, states the report of the Council of Association between the United Kingdom and ECSC, published on Monday. The percentage fell from 28.8 in 1958 to 27.7 in 1959, although total production in Britain and in the Community together was 4,000,000 tons less in 1958 than in 1957, and 6,000,000 tons higher in 1959 than in 1958.

Crude steel production in the Community had fallen to 58,000,000 tons in 1958, but in 1959 there was a record production of 63,200,000 tons—an increase of 8.9 per cent. It is estimated that capacity in 1959 was on the average 90 per cent. employed.

In Britain, "crude steel production did not recover from the effects of the recession of 1958 as rapidly as in the Community, and production of 20,500,000 tons in 1959 was only 5 per cent. above the previous year, and lower than in 1956 and 1957."

The report adds: "During the first quarter of 1959, production was at the low rate of only about 75 per cent. of capacity. From the second quarter onwards, however, output rose considerably, and by the end of the year it was at an annual rate of nearly 24,000,000 tons, or about 94 per cent. of capacity. The utilization of capacity over the year as a whole was about 84 per cent."

The Council decided to compare methods of forecasting long-term demand for steel in the Community and the United Kingdom. It also instructed its steel committee to study the rationalization of standards and dimensions for rolled steel products, and the expected future demand and capacity for wide strip for production of sheet and other products.

ANNUAL REUNION of pensioners of Smethwick Drop Forgings, Limited, was held recently. Long service awards were presented by Mr. R. Bennett, chairman and managing director.

Next President of Iron and Steel Institute

NEXT president of The Iron and Steel Institute will be Sir Charles Goodeve, FRS, director of the British Iron and Steel Research Association. He will succeed the present president, Mr. W. F. Cartwright, at the annual meeting of the institute in May next year.

SIR CHARLES GOODEVE

Sir Charles was born in Canada in 1904 and graduated at Manitoba University where he carried out research on electro-chemistry. In 1927 he was awarded a scholarship to University College, London, where he was appointed lecturer in physical chemistry in 1930 and reader in chemistry in 1937. During the second World War he served in the Royal Navy where, from 1942, he was in effective control of research and development, for which services he was knighted in 1946.

Sir Charles became Director of BISRA on its foundation in 1945 and combined administrative duties with research, making significant contributions on the physical chemistry of metallurgical processes. He was president of the Faraday Society from 1950-52, and president of the Chemistry Section of the British Association in 1956. In 1958-59 he was Master of the Worshipful Company of Salters. He became an honorary member of the council of the Iron and Steel Institute in 1945, and was elected a vice-president in 1956.

Beryllium Plant Sold by UK Atomic Energy Authority

BERYLLIUM works of the United Kingdom Atomic Energy Authority at Milford Haven has been sold to Consolidated Beryllium, Limited, which is managed by the Imperial Smelting Corporation—a wholly-owned subsidiary of the Consolidated Zinc Corporation.

The works have been operated on an agency basis by Murex, Limited, and operations are now to be continued by Consolidated Beryllium on a reduced scale.

Personal

British Electric Steel Makers' Guild

FIRST secretary of the British Electric Steel Makers' Guild, Mr. W. H. EVERARD, has been elected president of the guild for 1960-61. Mr. Everard, who is deputy general manager of the foundry division of Edgar Allen & Company, Limited, the Sheffield steelmakers, was a founder member of the guild.

MR. W. H. EVERARD

The guild was formed in 1957 to promote progress in the manufacture of steel for commercial purposes in electric melting furnaces and to encourage the exchange of information between members. Its new president is acknowledged to be the pioneer of the oxygen-lancing process in steelmaking in this country. For outstanding work in this field he shared with Mr. T. H. Harris, the Iron and Steel Institute's Williams prize in 1951. A co-author in their paper "The Use of the Oxygen Lance in British Electric Furnace Practice" was the late Mr. D. J. O. Brandt, former Metallurgical Editor of IRON AND COAL, who was ineligible to participate in the prize.

Mr. BASIL P. COOPER, recently retired after 10 years as managing director of William Cotton, Limited, hosiery machine manufacturers, of Loughborough.

MR. G. F. BARNES, group mechanical engineer at Sneyd Deep Pit and Wolstanton collieries (Staffs) has retired after 51 years in the mining industry.

Council of the Institution of Mechanical Engineers has awarded a James Clayton Fellowship to Mr. W. D. MORRIS for research on a compact form of heat exchanger.

MR. J. M. REYNOLDS, chief mechanical engineer for the No. 6 (Monmouthshire) Area of the South-Western Divisional Coal Board, recently retired after 49 years in the coal industry.

Works medical officer of Samuel Fox & Company, Limited, a member of United Steel Companies, Limited, of Sheffield, Dr. B. P. R. HARTLEY, is attending the International Congress of Occupational Health in New York. He returns to this country next month.

Mr. ARTHUR GARSIDE, a director of Augusts, Limited, manufacturers of foundry equipment, of Halifax, and Mr. R. BARLOW, former rolling mill manager of John Summers & Sons, Limited, ironfounders, of Stalybridge (Ches), both celebrated their golden wedding anniversaries on Saturday.

Assistant Area production manager for No. 3 Area, East Midlands Divisional Coal Board, Mr. JOHN THOMAS RICE retires at the end of the month after 56 years in the coal industry. He is a member of the Institute of Mining Engineers, and a past president of the Midland Counties Institute of Engineers. Mr. Rice holds a gold medal for a paper given with Mr. W. Goodman (Mansfield) in 1947 on "The Re-organization of Mansfield Colliery." He is Notts Northern Area Commissioner of the St. John Ambulance Brigade, and in 1948 was made MBE.

Long service certificates and good service gratuities were presented recently to Mr. JOSEPH C. SHARP and Mr. GEORGE CONWAY, who together have completed 106 years' service with Newton, Chambers & Company, Limited, ironfounders, engineers, and chemical manufacturers, of Thorncliffe, near Sheffield.

After 35 years' service with British Insulated Callender's Cables, Limited, Mr. L. R. B. SPENCE, deputy general manager of the Prescot Works, has retired. He joined British Insulated Cables, Limited, in 1925, and after holding appointments in various departments he was appointed manager of the engineering production division in 1948, later serving as Prescot Works manager, from 1952 to 1958, when he was appointed deputy general manager (Prescot).

After 25 years Mr. W. A. MACHIN, Sutton Coldfield, is relinquishing his representation of CEAG, Limited, makers of miners' electric safety lamps, etc., of Barnsley, and of M. B. Wild & Company, Limited, Birmingham manufacturers of colliery hauling, winding, and pumping machinery. This representation is being taken over by his son, Mr. A. MACHIN who is also joining his father in his consulting practice for several insurance companies and as a mining engineer.

Freedom of the borough of Huddersfield has been conferred on Ald. HAROLD ANDREW BENNIE GRAY, former director of W. C. Holmes & Company, Limited, gas and chemical engineers, and ironfounders, of Huddersfield. Before joining the company, to whose board he was elected in 1916, Ald. Gray was for a time chief engineer with William Beardmore & Company, Limited, steel forgers and founders, of Glasgow, where he was responsible for the erection and operation of various power plants, furnaces, and auxiliary machinery.

After 52 years in the mining industry, MR. HAROLD KIRK, assistant production manager, No. 1 Area of the East Midlands Divisional Coal Board, retires at the end of this month. He started work as a screenhand at Southgate Colliery (Derbyshire) when he was 13, and held his first post as colliery manager when he was 29 at Dowell Colliery. He became agent of Arkwright, Ireland, Markham, and Bolsover collieries on nationalization, and took up his present post in 1950. Mr. Kirk has been specially concerned with mine safety, and he is the inventor of a helmet visor and spine pad.

John Brown's Improved Results

GROUP net profit of John Brown & Company, Limited, shipbuilders and marine engineers, etc., of Clydebank, increased by £277,512 to £1,961,510, after tax of £1,683,710 (£1,669,155), in the year ended March 31, 1960. Final dividend of 7 per cent. makes 11 (10) per cent. for the year.

Wickman, Limited, machine-tool makers, of Coventry, which is controlled by John Brown, and Firth Brown Tools, Limited, a subsidiary, also showed increased profits. Wickman's is up from £370,513 to £515,194, after tax of £510,194 (£394,873), and the dividend is increased to 10 (8) per cent. Firth Brown Tools is paying a 12½ per cent. dividend compared with 9 per cent. for the previous year. Its profit was £255,344 (£174,498), after tax of £212,119 (£188,856).

In Parliament

STEEL ROD, BAR, AND WIRE

No Evidence of Restrictive Practices

NOBODY can hide the fact that there is a monopoly in the steel rod, bar, and wire business, said MR. HAROLD DAVIES (Lab.) speaking in the adjournment debate in the small hours of last Friday morning. It was no good talking about the initiative of the little man, he maintained, because the little man was not being allowed to use his initiative in the steel industry. He alleged that the entire wire-drawing industry could be squeezed by a ring or restrictive practices and asked how firms in both new and old areas of industry could keep going unless they had adequate supplies.

The steel industry, said Mr. Davies, was not meeting its commitments and one way in which the Government could help was by taking the duty off both wire and rods and bars. He referred to a small firm in his constituency which, he said, had been unable to purchase any rods or bars from any of the rod or bar rolling firms in the country. Since it was established three years ago, and in spite of inquiries through Government departments and the British Iron and Steel Federation, it had been unable to get the materials it needed for its business of making reinforced concrete. The same was true of many other small firms.

Replying, MR. JOHN C. GEORGE, Parliamentary Secretary to the Ministry of Power, gave statistics of production. UK production of ferro-concrete bars and rods was expected to reach 600,000 tons in 1960, 20 per cent. above last year's output, itself a record. Production of wire rods was expected to reach 1,500,000 tons, also 20 per cent. above the 1959 record. He admitted that pressure from home demand had been strong but emphasized that with the help of only minor imports the industry had been able to meet total demand. The minor help in the case of wire rods was 3 per cent. and in the case of bars and rods 4 per cent.

Board of Trade's Swift Action

As a result of discussions between the Iron and Steel Board and the users in April it was found that demand was outstripping production, even though production was rising so well and that a significant increase in imports of wire rods would be needed in 1960. Suggestions were made to the Board of Trade and the Board acted pretty swiftly, the import duty being suspended from July 1 to December 31. Individual difficulties could be and were certainly dealt with by invoking the aid of the British Iron and Steel Federation or the Iron and Steel Board. "I have a lot of experience in handling these complaints and in almost every case I never hear about them again," said Mr. George.

"What is not in existence is a system of allocating supplies to individual consumers. Our experience is that the informal arrangements, the normal commercial arrangements, work very well indeed, and the swift withdrawal of the tariff is an example of how consultation takes place for the industry's health."

Further, Mr. George continued, although the tariff had been withdrawn, the industry was not prepared to stand idle but was making plans for increasing production and three projects had been detailed resulting in a fairly big expansion of output. They would be completed at various dates, beginning this summer and ending in 1962.

Mr. Davies had spoken of monopolies and rings. He (Mr. George) had been informed that no record could be found of any agreement between the rod makers and the Reinforcement Manufacturers' Association which ensured members of the association preferential treatment in rod supplies.

"No Comment" by Chancellor on Rumoured Steel Bid

MR. HEATHCOAT AMORY, Chancellor of the Exchequer, refused to comment on what he described as "hearsay statements" that Mr. Charles Clore, the financier, wanted to acquire a share in the equity of Richard Thomas & Baldwins, Limited, the State-owned steel company.

When MR. DAVID GINSBERG (Lab.) asked him what negotiations had taken place or were contemplated between the Iron and Steel Holding and Realization Agency and Mr. Clore for the sale of any part of the company's equity, the Chancellor replied that he could not comment on rumours about bids for the prospective sale of particular steel companies in public ownership.

Asking for a more categorical assurance, MR. GINSBERG said that after the last debate about the company's future, Mr. Clore's spokesman announced that Mr. Clore would be interested in acquiring a substantial share of the equity if he were approached.

THE CHANCELLOR: "I cannot think it right to make a statement on hearsay evidence of that nature."

MR. HAROLD WILSON (Lab.) said that in the recent debate it was said that the Government was not going to proceed with this "act of vandalism." "Does it not mean, therefore, that your refusal to be more specific will give rise to a number of rumours that there is something very unsavoury going on?"

THE CHANCELLOR: "That is your view."

MR. CYRIL OSBORNE (Con.) asked the Chancellor if he would refuse to give consent to the sale of RTB ordinary shares by ISHRA until the fixed interest capital of the denationalized steel companies, which would have to be sold at a discount, had been disposed

of at satisfactory prices, with a view to ensuring that the agency would not be left with a heavy capital loss on preference and debenture stocks while the private purchaser made a profit on the ordinary shares.

MR. AMORY replied that, as the Minister of Power had told the House before, this was a matter of priorities which must be left for settlement from time to time in the light of all the circumstances.

MR. GINSBURG asked the Chancellor if, in the interests of furthering a "property-owning democracy," he would consider introducing a statutory restriction on the size of equity shareholding that might be sold or acquired in steel companies yet to be denationalized.

MR. AMORY: "I do not think that suggestion would accomplish its objective. There are many corporate bodies, such as insurance companies and pension funds, which invest on behalf of many small investors."

COAL AND COKE STOCKS

IN a written answer to MR. GERALD NABARRO (Con.), the MINISTER OF POWER, Mr. Richard Wood, said the National Coal Board's undistributed stocks on July 9 were about 35,000,000 tons of coal and 5,000,000 tons of coke. These stocks were valued at a little over £135,000,000 and were financed by Exchequer advances.

MR. WOOD told MR. EMANUEL SHINWELL (Lab.) in another written answer that any changes in the structure of the coal industry which needed legislation would naturally come before the House. He said he would also keep members informed about any other changes of significance.

COAL OUTPUT AND CONSUMPTION

AVERAGE rate of coal production in the first half of 1960, allowing for seasonal factors, was estimated at 196,000,000 tons a year, and consumption, including exports, at 199,000,000 tons a year, said MR. J. C. GEORGE, Parliamentary Secretary to the Minister of Power, in reply to a question by MR. NICHOLAS RIDLEY (Con.).

Total amount of coal stocked in the country in June this year was 48,800,000 tons compared with 50,000,000 tons last January, said MR. GEORGE. Of this total, distributed stocks accounted for 13,900,000 tons (14,300,000 tons in January), and undistributed stocks 34,900,000 tons (35,700,000 tons in January).

THE HOUSE OF COMMONS rose today (Friday). Reassembly after the summer recess would be on Tuesday, October 25, said Mr. Martin Redmayne, Parliamentary Secretary to the Treasury. It is expected Prorogation will take place on October 27 and the new Session will open on November 1.

THE MINISTER OF POWER told Mr. George Darling (Lab.) in a written reply that he had recently had a few complaints from engineering firms about shortages of steel but he had no evidence that exports had been significantly affected. According to the Iron and Steel Board supplies were generally adequate, but delivery periods had lengthened for some products.

ASKED BY Mr. John Stonehouse (Lab. & Co-op.) if legislation could be introduced to give the Minister greater powers to deal with air pollution caused by ironworks and other industrial undertakings, the Parliamentary Secretary to the Minister of Housing and Local Government said the Alkali Inspectorate and the local authorities had adequate powers. Improvement depended principally on technical advances, the study of which was continuing.

Lanarkshire Colliery Explosion

THREE men were killed and seven suffered burns as the result of an explosion at Cardowan Colliery, Stepps (Lanarkshire), on Monday. An official statement by Mr. James Lang, Area general manager of the National Coal Board, said that all the bodies had been recovered. In the House of Commons, Mr. Richard Wood, Minister of Power, said HM inspectors were investigating the circumstances of the accident, and he had directed Mr. H. R. Houston, HM Deputy Chief Inspector of Mines, to make a special report.

The explosion occurred two miles from the pit bottom and over 1,000 ft. underground. All the men involved, who included members of the mine rescue service, were working in connection with the reopening of the coking coal section in which there was a fire last January. The seal on the working had been broken and the miners were moving forward in a gas-filled section when the explosion occurred.

Breaching of the 5 ft.-thick baffle wall was undertaken nine days ago by heavy charges of explosive which were detonated from the surface, thus eliminating danger to personnel. It was the first time that the method had been used in a Scottish pit.

It was stated on behalf of the NCB on Tuesday that the explanation of what actually occurred remains unknown. All the men engaged in reopening the area were virtually handpicked and included Mr. F. Tootle, HM District Inspector of Mines, who was one of those injured. For safety reasons the approach to the operation was more prolonged than it might have been.

The procedure, the statement continued, had been planned in every detail with the full agreement of the Inspector of Mines, and the men's representatives were kept fully informed throughout. Regular air sampling at close intervals was also maintained from the time the main seals were opened more than a week earlier.

The main reason for reopening the section was to reach the coking coal. The section is capable of producing 400 tons a day, but while it remained sealed further expansion leading to a doubling of production was impossbile. A secondary consideration was the supply of methane gas, present in the section in large quantities and which, when drained off for feeding into the gas grid, produces a revenue of about £250 a week. In December, 1958, Cardowan became the first pit in Scotland to supply gas direct to the national grid and some 3,500,000 cu. ft. are pumped weekly.

The seals are being rebuilt and it is thought that it may be at least six months before any attempt would be made to break the seals again.

PART 2—"Coal Mining"—of the Census of Production for 1958 was published on Wednesday. It is obtainable from the Stationery Office, Kingsway, London, W.C.2, price 1s. 9d.

F. H. LLOYD & COMPANY, LIMITED, steelfounders and engineers, of Wednesbury—The chairman and managing director, Mr. F. N. Lloyd, in his annual review, states that although a large proportion of the company's castings was ultimately exported as components of the products of its customers, unmachined or partly machined castings, its main manufacture, were not a directly exportable commodity. The possibility that there might be a recurrence of severely competitive conditions could not be ruled out.

VERMICULITE *in Coal Mines*

New Method of Filling Large Roof Cavities

By H. WRIGHT*

Large roof cavities, resulting from extensive falls of roof, present two major problems to the mining engineer; they are difficult to support, while in gassy mines dangerous accumulations of firedamp can occur. This paper, read before the Midland Branch of the National Association of Colliery Managers on April 11, 1960, describes the use of vermiculite, a flameproof material with a high compressive strength, for filling large roof cavities. The author suggests further uses for this material in the building of fire barriers, ventilation doors, stoppings, and for protecting parts of roadways where strata movement is expected.

THE only factor common to vermiculite and coal is that they are both mined. Where one is heavy and dense, the other is extremely light. One burns to produce heat, the other is incombustible and resists the passage of heat. Vermiculite has, however, been found to possess the desirable properties necessary for cavity filling operations in the Arkwright and Markham collieries. It also has properties which may be useful in dealing with other mining problems.

Vermiculite is found in many countries throughout the world, but is mined on a commercial scale mainly in the US, Russia, South Africa, and Australia. It is a laminated mineral which resembles the inferior grades of mica when in its natural state, and when heated the crystals expand in a direction perpendicular to the laminae and may swell up to 20 times their original thickness. This process of expansion is termed "exfoliation" and it is in this exfoliated state (Fig. 1) that vermiculite has its commercial uses. It is commonly used for thermal insulation in building and to a small extent in the engineering trades.

Sometimes the granules of vermiculite are spread in the loose state to form an insulating layer, but often are mixed with cement, water, and a plasticiser to form a light-weight concrete. In this case the vermiculite granules are the aggregate which is much the same as the ballast in dense concrete, but the final result is, however, very different, for vermiculite concrete when dry will weigh from 20 to 50 lb./cu. ft. against 140 to 150 lb./cu. ft. for dense concrete.

* Manager, Markham No. 2 Colliery, No. 1 Area, East Midlands Divisional Coal Board.

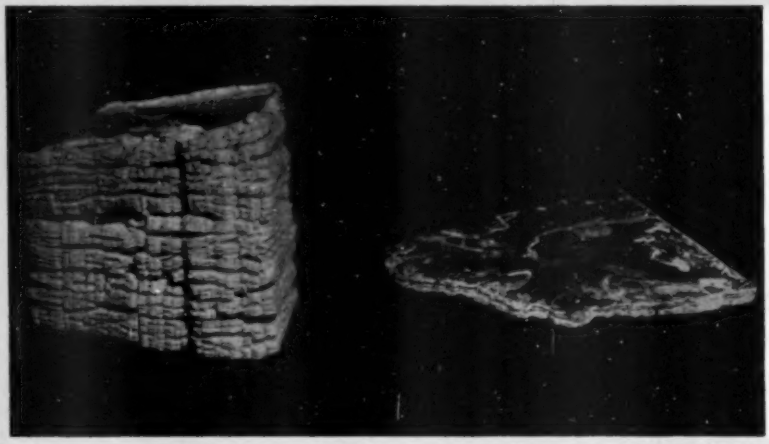


FIG. 1.—SAMPLES OF EXFOLIATED AND UN-EXFOLIATED VERMICULITE.

Properties and Use of Vermiculite

It is in the form of concrete that vermiculite is likely to be made use of in coal mines. The concrete may be mixed in varying densi-

ties and naturally the compressive strength will vary with the density.

Table 1, taken from "Vermiculite" by E. P. Varley* gives the relationship of the proportion of vermiculite to the strength of the concrete.

TABLE 1.—*Relationship between the Proportion of Vermiculite to the Strength of Concrete.*

Mix by volume.		Approximate density, lb./cu. ft.	Compressive strength, lb./sq. in.
Vermiculite aggregate, cu. ft.	Portland cement, bags.		
10	1	22	115
9	1	23	125
8	1	24	140
7	1	25	150
6	1	26.5	165
5	1	30	240
4	1	35	340
3	1	41	465
2	1	48.5	575

Vermiculite concrete has the peculiar property of compressibility. It is claimed by the manufacturers that a 12-in. by 6-in. by 6-in. block, having a density of 21 lb./cu. ft. and a compressive strength of 130 lb./sq. in., has a compressibility of 35 per cent. of its original volume without deterioration.

In addition to the properties of lightness and compressibility, vermiculite concrete is incombustible and resists the passage of heat. The manufacturers claim that a wall 12 in. thick built with vermiculite concrete has the equivalent thermal insulating value of a dense concrete wall 14 ft. thick.

The concrete is soft to the touch and can quite easily be sawn, or cut with a pick. Vermiculite is also claimed to be chemically inert and safe to use, without irritation to the skin or harmful to the breathing.

Fall of Roof at Markham No. 2 Pit Bottom

Much has been written and said of the dangers associated with roof cavities, and also of the difficulties of supporting these cavities and it is no part of this paper to elaborate on these dangers and difficulties, but rather to place on record some of the experience gained in the collieries of the No. 2 Group, No. 1 Area, East Midlands Division, in dealing with these problems using vermiculite concrete.

The downcast pit bottom of Markham No. 2 Colliery was enlarged in 1955 in order to accommodate machinery for skipwinding, and because of restrictions at the shaft, the roof girders for the support of the excavation had been jointed by fishplates in the centres of the girders which were necessarily 26 ft. long.

During the early part of 1957, water had built up in the old Waterloo Seam until it seaped along the old roadways of the Top Hard Seam workings, which were 145 yd. above the No. 2 pit bottom. This water was not seen until it had saturated all the strata surrounding the shaft and had appeared through the roof where the enlargement in the pit bottom had taken place.

On September 10, 1957, the joints of the roof girders broke and there was an extensive fall of roof, the position and extent of which are shown in Figs. 2 and 3. The fall occurred during the day shift while coal winding was taking place. There was no injury to personnel; the only person in the vicinity was the pit bottom controller, who saw the girders lowering and had time to withdraw.

The girders which broke came to rest with their ends still resting on the side walls and their broken centres on the plate belts, which are the skip feeders. The girders were still carrying most of the weight of the fallen debris.

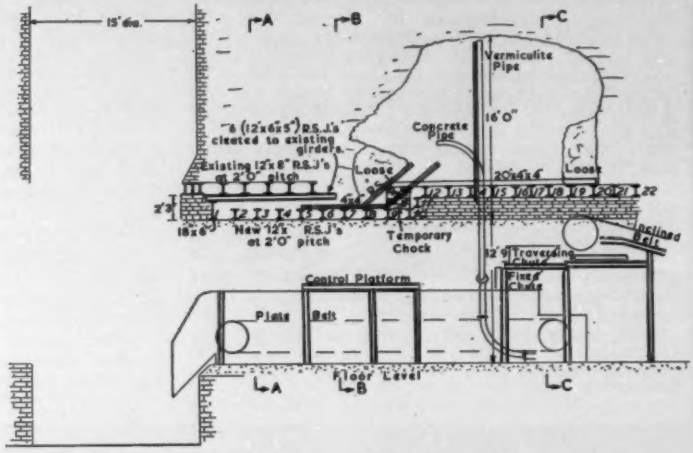


FIG. 2.—DETAILS OF FALL AND ARRANGEMENTS FOR FILLING CAVITY IN THE DOWNCAST PIT BOTTOM AT MARKHAM NO. 2 PIT.

Damage to the machinery was relatively small, it being confined to the operator's cabin, the control valves for the plate feeders, and the traversing chute and the head drive of the elevating conveyor. After small repairs to the control valves, the left-hand plate feeder was found to be free to run and this simplified the subsequent removal of the debris.

Meetings were held with the heads of the engineering departments to determine the possible dangers and the methods of dealing with them. The problems were:—

(1) How to prevent an extension of the fall, there being only some 12 ft. of ground between the cavity and the shaft side.

* Published by HM Stationery Office.

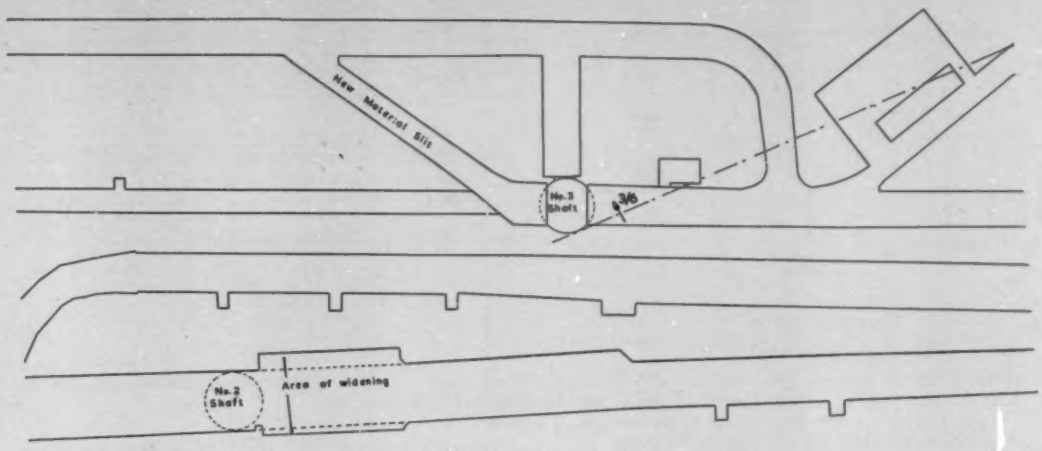


FIG. 3.—LOCATION OF FALL IN NO. 2 PIT BOTTOM.

(2) How to support the cavity after the completion of recovery.

(3) How to prevent an accumulation of gas in the cavity, although this was considered to be unlikely on account of the close proximity of the downcast shaft.

It was recognized that in order to meet all three of these requirements the cavity would have to be filled completely. The cavity, which was estimated at 6,400 cu. ft., and the filling would have to be supported by the roof girders. In consequence the roof girders, which still had to be 26 ft. long and, due to the restrictions at the shaft bottom, still had to be jointed, it was decided to stagger the joints of alternate girders one third of the distance across the excavation and to install strengthening struts, as shown in Fig. 4. The joints were also redesigned (Fig. 5).

Filling the cavity with normal concrete was considered and rejected because the weight would have been in the order of 400 tons, which was considered to be too heavy, and it was decided to use vermiculite concrete.

Advice was sought from the Building Research Station and the Dupré Vermiculite Company, Limited, to recommend proportions for a mixture which could be conveyed by compressed air. The mixture suggested was two bags of vermiculite to one bag of Portland cement, 10 gal. of water, and ¼ pint of Admix. The total weight of this material to fill the cavity was estimated at 69 tons. This mixture proved to be satisfactory in this and all subsequent roof cavity filling operations.

Method of Filling the Cavity

Equipment used comprised a 7-cu. ft. concrete mixer with an electric drive; a compressed-air concrete placer; 6-in. dia. steel pipes through which the concrete was placed; and 2-in. dia. pipes for air vents.

The side walls of the pit-bottom excavation had originally been built in concrete from the floor to a point 2 ft. 3 in. below the bottom of the roof girders, this last 2 ft. 3 in. having been finished in normal brickwork. It was decided to lower the roof line under the ground which had not fallen between the shaft side and the cavity down on to the top of these concrete walls (Fig. 2) and new girders fitted in this position. The web of the new girders was shuttered with 6-in. by 3-in. fireproof boards. The 6-in. concrete placing pipes and the 2-in. air vent pipes were installed through this shuttering into the highest part of the cavity, also

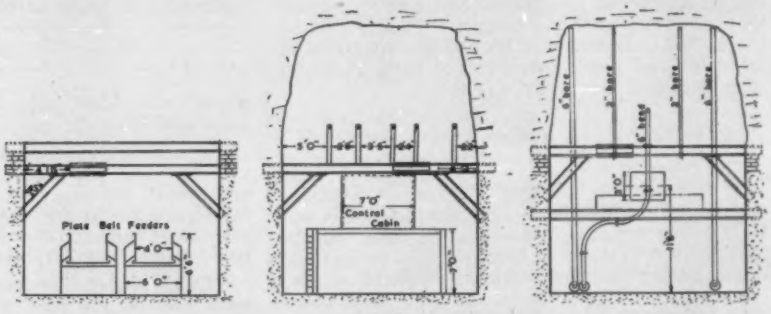


FIG. 4.—DETAIL SHOWING THE METHOD OF PROVIDING ADDITIONAL SUPPORT AT THE FALL OF ROOF IN THE DOWNCAST PIT BOTTOM AT MARKHAM NO. 2 COLLIERY. (SECTIONAL DETAILS REFER TO FIG. 2.)

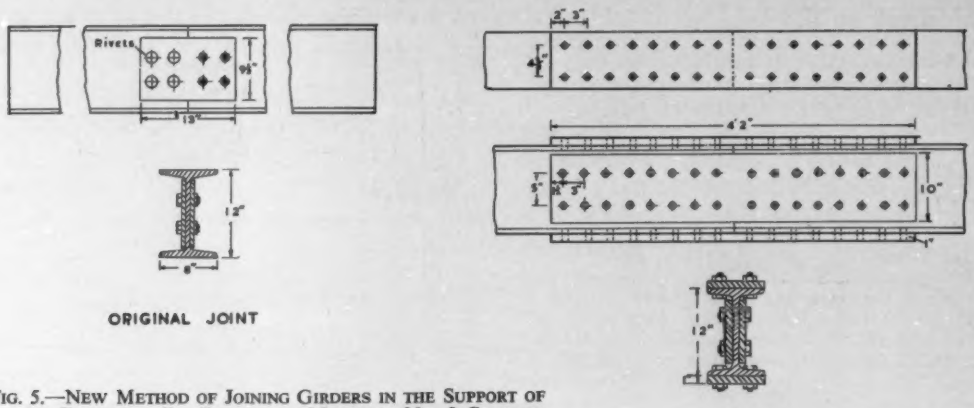


FIG. 5.—NEW METHOD OF JOINING GIRDERS IN THE SUPPORT OF THE DOWNCAST PIT BOTTOM AT MARKHAM NO. 2 COLLIERY COMPARED WITH THE PREVIOUS METHOD.

a 90-deg. bend pipe was inserted into the shuttering through a stand-pipe in such a manner that it was capable of turning through 360 deg. in the horizontal plane.

The concrete mixer was installed on the ground level near to the skip feeders and this was so arranged that it could be emptied directly into the compressed-air concrete placer. The concrete placer was a simple colliery-made device, which consisted of a 14-in. pipe, 3 ft. 6 in. long with a lid over the filling aperture which could be clamped down on to a rubber seal, and had a 6-in. outlet for the concrete and three 1¼-in. air-inlet pipes. The 1¼-in. air-inlet pipes were connected to a small air receiver, which in turn was fed by a 2-in. feed from the main surface air compressors. This feed had a gate-type valve so that the air could be admitted almost instantaneously.

The placer was first connected to the 90-deg. bend pipe and ordinary concrete was placed between all the girders from the shaft side and across the cavity, and for 12 in. above them after which the placer was connected to the vertical pipes and the vermiculite concrete mixture was blown into the remainder of the cavity, and finally through the 2-in. pipes until the compressed air would no longer flow. Record was kept of the quantities of materials used and examination of these quantities suggested that the cavity was full.

Costs

The filling of the cavity was completed at weekends between the hours of 10 p.m. on Saturday and 6 a.m. on Monday. The reason for this was that it was considered desirable to cover up the machinery with sheets in order to avoid cement and water getting into the bearings, etc., and in consequence the labour costs were at double-time rates. Costs of the work are given in Table 2.

The volume of ordinary concrete placed was 1,720 cu. ft. The volume of vermiculite concrete placed was 5,760 cub. ft. (These figures were calculated from the quantities of materials placed.)

TABLE 2.—*Cost of Filling Cavity at Markham No. 2 Pit Bottom.*

	£	s.	d.
Materials			
1,920 bags of vermiculite at 6s./bag ..	576	0	0
71 tons of cement at £5 12s./ton ..	397	12	0
69 tons of gravel	72	9	0
46 tons of sand	38	10	6
800 fireproof boards	86	13	6
32-ft. by 6-in. compressed-air pipes at 10s./ft.	16	0	0
32-ft. by 2-in. compressed-air pipes at 2s./ft.	3	4	0
One 6-in. 90-deg. bend	8	2	0
30 gal. Admix at 12s. 6d./gal. ..	18	15	0
	1,217	6	0
Wages			
Bricklayers—48 shifts at 75s. 2d./shift	180	8	0
Labourers—48 shifts at 63s. 4d./shift	152	0	0
Materials—72 shifts at 65s. 4d./shift	235	4	0
	567	12	0

The ordinary concrete was placed during the first two weekends and four men were employed on each shift carrying the materials past all the machinery on to the site, and it was found that when the vermiculite was being used this work could be done comfortably by two men.

Careful observation has been kept on the shaft walls and on the roof girders in the pit bottom since this incident occurred, and after two and a half years no measurable movement has taken place.

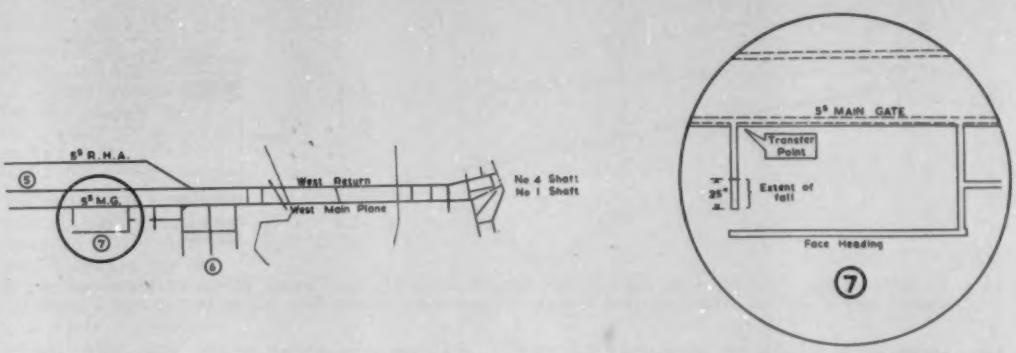


FIG. 6.—WORKINGS IN THE BLACKSHALE SEAM AT MARKHAM NO. 1 COLLIERY AND DETAILS OF THE POSITION OF THE DEVELOPMENT AT THE TIME OF THE FALL.

Fall in and Main Gate Development Heading at Markham No. 1 Colliery

On November 22, 1958, an extensive fall of roof occurred in 7's loader gate heading in the Blackshale Seam at Markham No. 1 Colliery, leaving a roof cavity of approximately 10,000 cu. ft. Fig. 6 shows the workings in the Blackshale Seam West District, with 5's unit working to the rise at 1 in 15.5, 6's unit and 7's unit development working at right angles to the main roads with their gates approximately level. 7's unit was planned to be a 200-yd. plough face with a 90-yd. pillar from the main plane, and the nearest adjacent working was 6's unit, which was 180 yd. away to the dip.

Fig. 6 also shows the position of the development at the time of the fall and the extent of the fall. The left gate and 200 yd. of the face heading had been completed, and only 18 yd. of heading remained to be driven when the fall occurred. The fall started from the 50-yd. mark in the main gate and extended to the face of the heading which was at 75 yd.

A section of completed roadway before the fall supported by 16-ft. steel joists set on 7-ft. wood legs is shown in Fig. 7. The girders were set 3 ft. 6 in. apart and strutted between. The roadway was dinted to give an overall height with the seam extraction of 7 ft. 6 in. The cross-section of the cavity is superimposed on the section.

Method of support after the fall, also shown in Fig. 7, comprised 13-ft. by 9-ft. steel arches set through the fall area, covered with 1½-in. cover boards and wire bags filled with stone packed at the sides and placed over the top.

Fig. 8 shows a sketch of the Blackshale Seam and Cannel Seam converging at 1 in 15.5 and 1 in 20, respectively. The Cannel Seam at Markham No. 1 shaft is 70 ft. above the Blackshale Seam, and at a point approximately 1,720 yd. from the shaft, runs contiguous to the Blackshale Seam with only 1 ft. of dirt separating the two seams.

The section shows the relative position of 7's unit loader gate, and at this point, on the above assumption, the vertical interval between the Blackshale and the Cannel seams is approximately 20 ft.;

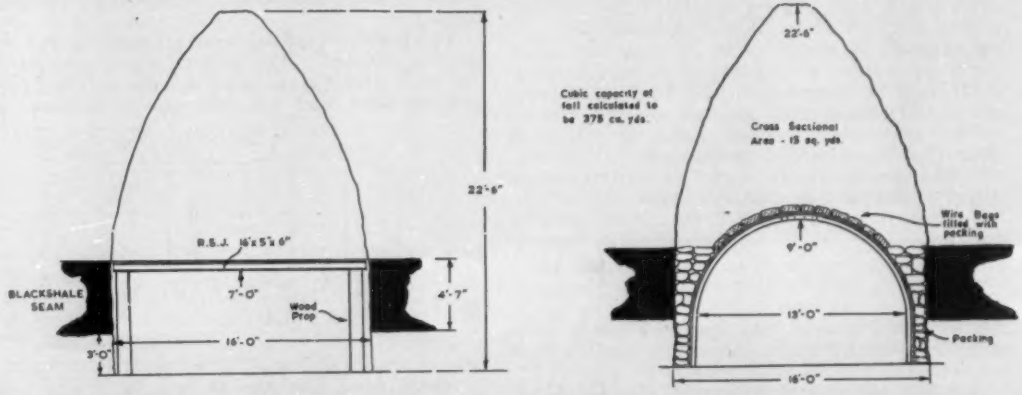


FIG. 7.—METHOD OF SUPPORT OF ROADWAYS IN THE BLACKSHALE SEAM AT MARKHAM NO. 1 COLLIERY, BEFORE THE FALL (LEFT) AND AFTER THE FALL (RIGHT).

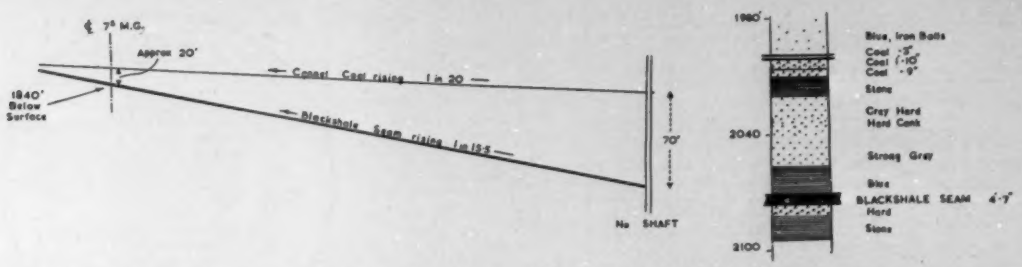


FIG. 8.—SECTION SHOWING THE CONVERGENCE OF THE BLACKSHALE AND CANNEL SEAMS AT MARKHAM NO. 1 COLLIERY AND A SECTION THROUGH THE STRATA SURROUNDING THESE TWO SEAMS IN THE NO. 1 SHAFT.

and therefore it could be suggested that the strata was weak at this point.

The section shown in Fig. 8 is that found in the Markham No. 1 shaft, but due to the convergence of the two seams the nature of the intervening strata in 7's loader gate is a matter of conjecture.

The problems associated with this cavity were (1) gas accumulations in the cavity at a point close to the working face in a seam which is already recognized as being gassy, (2) subsequent movement which was to be expected at this point when the face moved away.

It was therefore decided to fill the cavity completely with vermiculite concrete (Fig. 9). During the cleaning up of the fall and the setting of the arches concrete placing pipes and air-vent pipes were erected through the shuttering at intervals of 5 yd. throughout the length of the fall; also during the erection of the arches a layer of wire bags filled with small stone was laid over the boards.

The equipment and mixture used for the placing of the vermiculite was the same as that used in the Markham No. 2 pit bottom. The labour used was the men who had previously been driving the heading. Cost figures are given in Table 3.

TABLE 3.—*Cost of Filling Roof Cavity in Blackshale Seam at Markham No. 1 Colliery.*

Materials	£	s.	d.
2,525 bags of vermiculite at 6s./bag	757	10	0
63 tons of cement at £5 12s./ton ..	352	16	0
48 gal. of Admix at 12s. 6d./gal. ..	30	0	0
Five 15-ft. by 6-in. dia. compressed-air pipes at 10s./ft.	37	10	0
Four 15-ft. by 2-in. dia. air vent pipes at 2s. 3d./ft.	6	0	0
	1,183	16	0
Wages			
133 shifts at 54s. 11d./shift	365	3	11
Five-day week bonus	58	8	8
	423	12	7

7's face was started up in May, 1959, and at the time of writing has advanced a distance of 200 yd. There has been considerable strata movement along most of the loader gate, mainly in the form of floor lift, but the portion of the road where the fall occurred and over which there is now a vermiculite filled cavity, shows considerably less damage than the remainder of the gate. The reason for this may well be that the closure has taken place by compression of the vermiculite instead of in the floor lift, as is happening in the remainder of the gate.

Fall at Arkwright Colliery

An extensive fall of roof occurred at Arkwright Colliery in January, 1959, which created a cavity of 5,400 cu. ft. The fall occurred at the junction of the main roads of the Top Hard and First Waterloo main intakes, a position which had previously been a loading point. The fall occurred as a result of the brick pillars forming the old junction having split and allowed the bearing girders at one side to collapse, which in turn released the main support of the junction.

As the junction was on the main intake airway, it was considered essential to fill the cavity completely to avoid further roof movement, and the experience gained at the two Markham pit incidents suggested that vermiculite should be the filling agent.

The brickwork pillars were all renewed and the girders replaced. The girders were shuttered in the webs with 3-in. fireproof boards and four 6-in. placing pipes and 1-in. air-vent pipes were in-

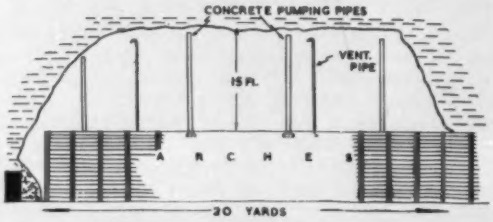


FIG. 9.—DETAILS OF FALL IN 7's MAIN GATE, BLACKSHALE SEAM, AND THE METHOD OF FILLING THE CAVITY WITH VERMICULITE.

stalled through the shuttering to the high points of the cavity. (It was subsequently found that only one of the placing pipes proved to be necessary to fill the cavity.)

The equipment and mixture were again the same as at the Markham incidents, but this time the compressed-air supply was through an inbye compressor which had a capacity of 300 cu. ft. of free air per min.

This time it was decided to lay a 6-in. layer of ordinary concrete over the girders and this was placed through the pipes which were inserted to the top of the cavity, and while placing this concrete it was found that with the limited quantity of compressed air available the height of the placing pipes was about at the upper limit for placing ordinary concrete, but, however, there was no difficulty experienced with placing the vermiculite.

Fig. 10 shows the general details of the fall and installation of the equipment and Table 4 a cost summary of the work.

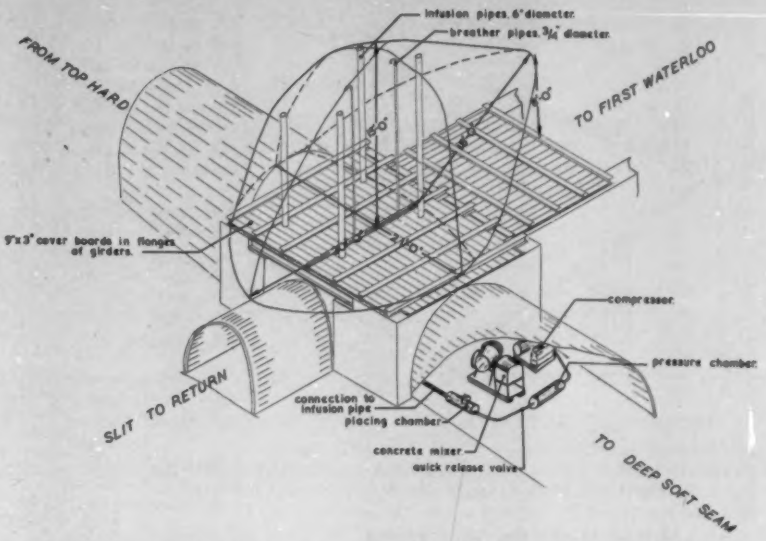


FIG. 10.—GENERAL DETAILS OF THE FALL AT ARKWRIGHT COLLIERY AND THE INSTALLATION OF THE EQUIPMENT FOR FILLING THE RESULTING CAVITY.

TABLE 4.—*Cost of Filling Roof Cavity with Vermiculite at Arkwright Colliery.*

Materials	£	s.	d.
44 tons of cement at £5 12s./ton ..	246	8	0
1,600 bags of vermiculite at 6s./bag ..	480	0	0
4 tons of sand	3	7	0
6 tons of gravel	6	6	0
25 gal. of Admix at 12s. 6d./gal. ..	15	12	6
320 fireproof boards at 4s. each ..	64	0	0
Four 15-ft. by 6-in. compressed-air pipes at 10s./ft.	30	0	0
Four 15-ft. by 1-in. vent pipes at 10d./ft.	2	10	0
	848	3	6

Wages	£	s.	d.
Four joiners at 39s. 4d./shift ..	7	17	4
13 bricklayers at 39s. 4d./shift ..	25	11	4
97 labourers at 32s. 11d./shift ..	159	12	11
Five-day week bonus	38	12	4
	231	13	11

Drifting at Markham No. 2 Colliery

Fig. 11 shows the arrangement when commencing two drifts in Markham No. 2 Colliery, although the return drift at the time of writing has not been started. The development of Markham No. 2 Colliery necessitated the driving of two drifts to connect the Ell Seam workings with the Deep Soft Seam. Fig. 12 shows the position of the drift which was chosen to be in line with the main trunk road of the pit. The starting point of the drift was inbye of the "Coalite" district main road and was to dip at a gradient of 1 in 6 in line with the old Ell Seam road, which was level.

The old Ell Seam road was supported with 13-ft. by 10-ft. arches and has been previously back ripped due to water having caused bad ground. The drift was fixed in this position and the starting point was fixed by consideration of the need for concentration of output, and the need to relate the position of the future Deep Soft Seam main roads to the Bolsover Colliery Deep Hard main roads, in order to avoid interaction by seams. The gradient of the drift was fixed partially by the latter, and partly by the equipment available for driving the drift, although any alteration in the gradient would not have helped to avoid the bad ground.

In addition to the bad ground problem it was also necessary to ventilate the old workings which were being salvaged. It was recognized that before the roof of the drift had been properly supported, the cavity above the arches would probably be some 20 ft. high. It was therefore decided to fill the old roadway with a vermiculite concrete stopping.

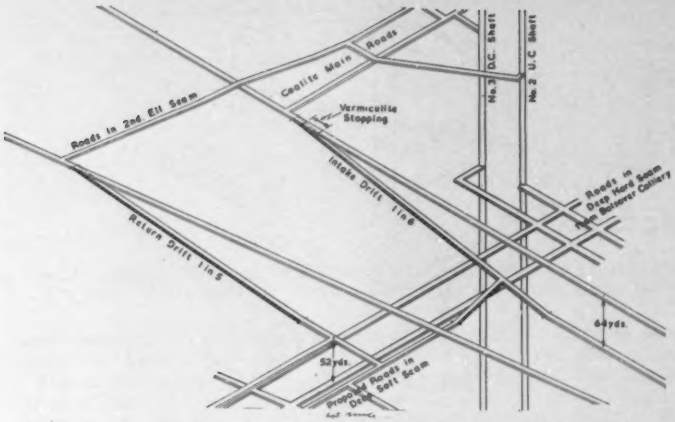


FIG. 11.—ISOMETRIC LOCATION OF THE DRIFTS TO BE DRIVEN FROM THE ELL TO THE DEEP SOFT SEAM AT MARKHAM NO. 2 COLLIERY.

Method of Placing the Stopping

The old road was first cleaned up to a sound floor for a distance of 25 yd., and a 2-ft. dia. steel ventilation tube was suspended in the roof of the old road throughout the length of the proposed stopping and a 9-in. brick wall was built as the inbye shuttering. Temporary wooden shuttering was erected 5 yd. outbye of the brick wall and through this were installed two 6-in. concrete placing pipes, one either side of the ventilation tube.

The concrete mixer and placer (Fig. 13) were installed just inbye of the "Coalite" junction, which was a distance of 55 yd. from the inbye end of the stopping. The compressed-air supply was from the surface compressors. During the placing of the vermiculite in the first 5 yd. of the stopping it was found that when blowing the mixture along the horizontal pipe the quantity of water in the mixture proved to be very critical, because when the mixture was excessively wet there was a tendency for the larger particles to be blown out of the water, and the method of placing the ingredients into the mixer needed some experimentation. It was finally found that the best method was to place 10 gal. of water and ¼ pint of Admix in the mixer, add one bag of cement and run the mixer to obtain a sloppy grout, add one and a half bags of vermiculite and run to a sloppy mix, and add half a bag of vermiculite and run for one minute for the mixture to dry. The mixing time for all this was approximately 3 min./mix.

During the placing of the first 5 yd. of the stopping it was found that this mixture could be blown a considerable distance out of the end of the pipe and also that when it was ejected out of the end of the pipe on to the face of the stopping

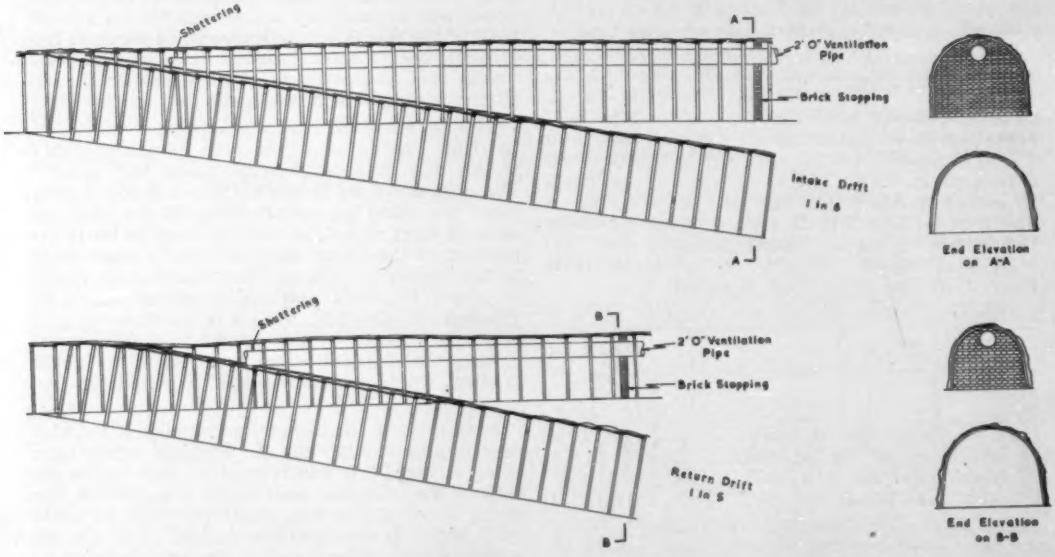


FIG. 12.—SUPPORT DETAILS AT THE STARTING POINTS OF THE INTAKE AND RETURN DRIFTS TO BE DRIVEN FROM THE ELL TO THE DEEP SOFT SEAM AT MARKHAM NO. 1 COLLIERY.

it stood at an angle of repose of about 60 deg. In consequence, the shuttering was next moved to the outbye end of the stopping and the next 20 yd. was placed without any further movement, and also as the concrete was placed the remainder of the arches in the old road were removed in order that, when drifting commenced; the legs of the old arches would not be fouling the excavation for the new drift.

The whole of the stopping which was approximately 9,000 cu. ft. was placed in 30 shifts. This time could have been improved considerably by redesigning the filling aperture on the concrete placer. It was found that with the drier mix the mixture would not flow properly into the placer and much of the time was lost in pushing the material into the placer.

The work was done by the men who were eventually to be the drifting teams. No specialist labour was used except the joiners who erected the shuttering. Table 5 shows the cost of the work.

Two weeks after the placing of this stopping drifting was started, and it was found that the vermiculite could be quite easily removed and spanned the necessary distance of 3 ft. 6 in. in order to set the next arch, without any tendency to break up with the exception of the sides, where if the vermiculite was less than 2 ft. thick it tended to pull off the sides, and this appeared to be probably due to a layer of dust lying between the stone and the vermiculite. The quantity of water in the vermiculite did not appear to have soaked into the dust.

When the drift reached a point where the roof of the drift and the bottom of the stopping coincided, support of the floor of the old road was made when its thickness was only about 6 in. The rate of progress of driving through the stopping was 6 in. per manshift, but all shotfiring was confined to single shots and a limit of 1 yd. was placed on the distance to be advanced with each firing.

TABLE 5.—*Cost of Placing a Vermiculite Stopping at Markham No. 2 Colliery.*

	£	s.	d.
Materials			
2,948 bags of vermiculite at 6s./bag	884	8	0
74 tons of cement at £5 12s./ton ..	414	8	0
46 gal. of Admix at 12s. 6d./gal. ..	28	15	0
13—24-in. dia. steel ventilation tubes	62	8	0
	1,389	19	0
Wages			
Joiners—four shifts at 40s. 4d./shift	8	1	4
Labourers—120 shifts at 54s. 11d./shift	329	10	0
Five-day week bonus	54	0	3
	391	11	7

Medical Investigation

In all the cavity filling operations that have been carried out to date, no difficulties have been experienced with the placing of vermiculite vertically, and what difficulties there have been when placing the vermiculite horizontally were easily overcome by using a drier mixture. However, in the exercises carried out at the Arkwright and Markham No. 2 collieries, the men working with these materials did experience minor skin troubles which their local doctors described as dermatitis.

FIG. 13.—PLACER USED IN THE FORMATION OF THE VERMICULITE STOPPING.

The Area medical officer was asked to investigate the troubles and included here is his report:—

"Following complaints from men engaged in stopping off an airway, using a mix of cement and vermiculite, with the assistance of Admix, I went to see the job on Tuesday, December 1, and had the opportunity to examine a few of those whose hands had been affected.

"I am quite convinced that it is cement that is the enemy, and neither vermiculite nor Admix has any direct effect. The latter, however, by reason of its property of lowering surface tension, does make possible the deeper penetration of cement particles into any skin abrasions."

Cement is a notorious agent for causing in any skin inflammatory reaction especially as dry powder, by reason of its alkalinity and its hygroscopic nature. If cement gets into any minute breach in the skin surface, a "cement hole" develops—a shallow ulcer that heals only slowly.

To prevent dermatitis from cement, it might seem that gloves would help. They do, if they fit snugly enough to prevent the entry of both cement dust and of any mixture containing it. If they are such as make it possible for cement to get inside, they are worse than useless, as there is then the additional trouble of cement dust being constantly rubbed into the skin.

Opinions differ as to the efficacy of barrier creams, but the author advises their use, without the wearing of gloves, provided the barrier cream is water repellant. The usual form of "Rosalex" in use is the oil-resistant type; this is soluble in water, and useless for cement-mix handlers. A water repellant form of "Rosalex" and of "Innoxa," and, in fact, most of the well-known products exists. It is useless to apply the cream at the beginning of a shift and expect it to remain until shift end. It must be renewed from time to time, the skin being washed each time before reapplication. A fatty hand cream should be rubbed into the skin at the end of each shift.

Any breach of the skin surface must be covered with a suitable waterproof dressing and kept covered while at work.

To summarize the methods of preventing cement dermatitis the author suggests:—

(1) Cover every abrasion, however small, while at work, with a waterproof, occlusive dressing.

(2) Apply water-resistant barrier cream thoroughly before starting work.

(3) Wash the hands thoroughly three or four times during the shift, using a bland soap—not carbolic, coal tar, or other medicated soap. Dry the skin thoroughly after each washing and reapply barrier cream.

(4) Apply a fatty hand cream at the end of the shift.

(5) Gloves that are porous or allow dust or water in at the cuffs are useless.

Conclusions

The experience to date suggests that the problems associated with large roof cavities, both with regard to support and gas accumulation, can be adequately dealt with by filling the cavities with vermiculite concrete. The advantages of using vermiculite for this purpose can be enumerated as follows:—

(1) Vermiculite is delivered in standard size sacks containing 4 cu. ft. of vermiculite, and are so light that a man can easily carry a bag under each arm.

(2) The concrete mixing is made quite simple for untrained personnel to gauge each mixture and produce batches of concrete of equal consistency.

(3) The concrete can be lifted to considerable heights, or conveyed considerable distances horizontally with a small quantity of compressed air.

(4) The material is completely fireproof.

(5) The concrete seems to absorb subsequent strata movement without distortion of the supports.

Vermiculite concrete may well be used for other purposes in the pit. The author suggests that the following problems are worthy of examination:—(1) In conjunction with steel doors, for the building of fire barriers between double intakes; (2) for the building of ventilation doors in roadways where strata movement is taking place; (3) for the cushioning of important parts of roadways where strata movement is expected, *e.g.*, junctions, engine houses, etc.

Acknowledgment is made to Mr. N. Siddall, Area general manager, for his permission to read this paper; Mr. G. Inverarity, Area production manager, for his encouragement to write the paper; Mr. Warren Hitchins, of the Dupré Vermiculite Company, Limited, for his assistance; Dr. Forrester, Area medical officer, for his report; and the colliery surveyors and Area printing and photographic departments. Any opinions expressed are those of the author and not necessarily those of the National Coal Board.

DISCUSSION

MR. E. MAIDEN commented that in the paper vermiculite was stated to be alkaline. The paper also said it was a "safe" substance and asked if the two statements were contradictory. He also wondered if the author had thought to apply vermiculite in precast form for use as lagging between arches.

The paper might appear to be contradictory when it stated firstly that vermiculite was chemically inert and safe to use and then went on to describe some skin troubles which were experienced, replied the AUTHOR, but the medical report cleared up the apparent contradiction when it clearly stated that it was the alkalinity and hygroscopic nature of the cement which caused the trouble. Regarding the use of vermiculite concrete to make lagging slabs, the AUTHOR had no personal experience, but suggested that while the material would do the job in settled ground it was more expensive than ordinary concrete.

MR. G. A. PERCIVAL also wondered whether vermiculite could be precast and used in the form of blocks. He was told that it could be precast into blocks and it was being used in this manner in South Africa. The manufacturers in South Africa were marketing vermiculite concrete blocks under a trade name of "Vicrete Blocks."

Replying to MR. W. SHARPE, who asked if vermiculite had water resistant properties, the AUTHOR said vermiculite concrete absorbed a considerable

quantity of water, but did not deteriorate in the presence of water.

MR. W. MORRELL asked whether the author had tried vermiculite as a grout seal around air crossings.

The AUTHOR had no experience of using vermiculite for this purpose and he thought conventional materials would do the job equally well, if not better.

MR. J. MITCHELL asked if any other materials had been considered either as "fillers" or "binders." He was thinking of "pearlite" and plaster. The AUTHOR replied that on the incidents which had been described, vermiculite had done the job in a very satisfactory manner and the other materials suggested had not this property of compressibility to the same degree and therefore had not been considered.

MR. W. F. MORRELL, commenting on the increasing use of fabricated air crossings, which were usually sealed around the ends with sandbags, asked if vermiculite could be used in place of sandbags and, if it was better to blow it in or use it in block form.

In reply, the AUTHOR said vermiculite concrete might well be used for this purpose because if there were any subsequent strata movement the concrete would compress and so avoid damage to the air crossing. He thought there would be a better ventilation seal if the concrete was placed when wet by blowing or pouring into shuttering.

MR. W. A. WOOD asked whether in the inbye falls it had not been thought advisable to alter to a lighter mixture to make more use of the compressibility feature of this material as against the heavier mixture for strength. The AUTHOR replied that the mixture first suggested by the Building Research Station and the Dupré Vermiculite Company was 8 cu. ft. vermiculite to 1 cub. ft. cement, which was a rather weak mixture; it had proved to be satisfactory and consequently no alteration was made.

Setting Time

MR. DENMAN asked what was the setting time for vermiculite and whether the setting was affected by lower temperatures such as the pit bottom for instance was told that the setting times appeared to be much the same as ordinary concrete and would be similarly affected by temperature.

MR. F. RIMMER spoke of a more recent cavity at the surface at Arkwright Colliery where vermiculite had again been used. In this case the men employed had been able to wash their hands more frequently and warm water was available. In this case there had been no dermatitis.

The reason for the trouble which the workmen underground experienced, said the AUTHOR, might be that colliers were more susceptible to small skin abrasions which were not normally noticed.

MR. P. HALLAM spoke of a roadway being driven across old goaf where there was danger of air leakage and asked if such a roadway could be lined with vermiculite to prevent air leakage. Replying, the AUTHOR said vermiculite concrete could be made dense enough to hold normal ventilating pressures but unless there was a materials handling problem such a job could be done more cheaply by conventional materials.

MR. T. R. JAMESON asked if this was a proper subject for use by rescue teams for a seal or a plug underground. Tests, replied the AUTHOR, would be necessary by the Safety in Mines Research Establishment before it was used for this purpose, but if it was found to be a suitable material then the placing of a stopping would be a much easier job than it was when using conventional materials.

MR. BIDDULPH suggested that if water would pass through vermiculite then, in time, it would allow air leakage and possibly bleeding of gas from a feeder in a cavity. In reply, the AUTHOR said a feeder of gas from a particular point, especially when at the top of a cavity, was a difficult thing to dilute and he thought that allowing it to diffuse through a mass of vermiculite concrete so that the issue was spread over a large area would help in the subsequent dilution of the gas.

Replying to MR. GIFFORD, who asked what success the author had had with mechanical placing, the AUTHOR said a worm feed arrangement had been tried, but without much success; the best equipment tried was the DeWitt fireproofing machine which would both mix the concrete and place it through a 1½-in. pipe, It had a limitation due to the small compressor and needed a compressor of about twice its present capacity.

MR. O. T. STORRS suggested that in moving ground, concrete, or brickwork pillars were in many cases responsible for breaking up the floor. This might be a case for experimenting with vermiculite blocks at the floor to prevent such breaking, he said. The AUTHOR thought there was a case for experiment in that direction. Experience gained in the Markham No. 1 and the Arkwright incidents suggested taking out extra ground over the supports and filling the intervening space with vermiculite concrete.

Book Review

Colliery Year Book and Coal Trades Directory, 1960. Iliffe & Sons, Limited, Dorset House, Stamford Street, London, S.E.1. 916 pp. 40s. (by post 41s. 9d.).

THE 38th edition of this well-known work of reference dealing with the coal and allied industries contains, as usual, a vast amount of varied information which has been carefully revised and supplemented where necessary. Thorough subdivision and classification, together with a personal index, render information readily accessible. A foreword is contributed to the present edition by Mr. Richard Wood, Minister of Power.

It is impossible in the space available to review the whole of the contents in detail. Prominent, of course, is the Ministry of Power and the various boards, including the National Coal Board and the Divisional Coal Boards. A map of Great Britain shows coalfields and Divisional Coal Board headquarters. A list of coal mines gives their managers, number of employees, and outputs, and there is also a list of licensed mines. Other features include a coal trade directory, a "who's who" in the coal industry, a list of mines in western Europe, and details of the largest mines in the United States.

There are numerous useful statistical tables dealing with the British coal industry and an international section giving coal resources, world production, employment and output, coal imports, exports, and consumption, accidents, and a table comparing conditions in the principal coal-producing countries in Europe and the United States.

A FOLDER containing details of the many films which it has made for the Dunlop organization has been issued by Sound-Services, Limited, Wilton Crescent, Merton Park, London, S.W.19. Among the films are "The Care and Maintenance of Conveyor Belting," which was reviewed in our July 8 issue (p. 83).

New Literature

NEW catalogues, booklets, and other publications which have recently been received include those mentioned below. Readers interested in obtaining a copy of any of the publications referred to should apply direct to the address given, at the same time mentioning IRON AND COAL.

RANSOMES & RAPIER, LIMITED, Waterside Works, Ipswich—A brochure just issued gives full technical particulars of the RapieR 4P40 self-priming water pump.

J. H. FENNER & COMPANY, LIMITED, Marfleet, Hull—Leaflet No. 580/20 deals with the introduction of a completely redesigned range of Fenner-Platt dry plate clutches.

E. BOYDELL & COMPANY, LIMITED, Old Trafford, Manchester 16—News of Muir-Hill dumpers, loaders, and shunters is to be found in the July issue of the Boydell Bulletin, an eight-page news-sheet.

ELECTRICAL APPARATUS COMPANY, LIMITED, St. Albans (Herts)—Illustration sheet 140 gives details of the company's small horsepower direct-on autoswitches, which are available for a wide variety of duties.

NATIONAL COAL BOARD, Hobart House, Grosvenor Place, London, S.W.1—The summer number of Outlook on Education and Training in the Coalmining Industry carries many articles mainly designed for traineees, but of value to all engaged in the mining industry.

BROWN, LENOX & COMPANY, LIMITED, Pontypridd (Glam)—"Steel Castings," a booklet published by the company, is an indispensable source of reference for any user of steel castings. It will appeal particularly to design engineers, draughtsmen, and purchasing officers.

BRITISH OXYGEN COMPANY, LIMITED, Bridgewater House, Cleveland Row, St. James's, London, S.W.1—Pennant is an eight-page newspaper presenting the latest news of the group from all over Britain. The August issue of this very well laid out paper has just been published.

BRITISH ROPES, LIMITED, Carr Hill, Doncaster—Every issue of Rope Talks, the company's well-produced magazine, tells of some way in which the company's products have served industry. The latest edition, which is no exception, also contains other interesting articles and photographs.

THE ENGINEERING CENTRE, Stephenson Place, Birmingham 2—News Letter, the July issue of which is now available, is published monthly to give exhibitors and other interested organizations an insight into the various activities of the centre and to encourage all interested in engineering to make use of the centre's extensive facilities.

SUFFOLK IRON FOUNDRY (1920), LIMITED, Stowmarket (Suffolk)—Sif-Tips costs 6d. and is devoted to welding matters. The summer number of this little magazine contains stories on the restoration of a church roof, speeding sports car production, and an article dealing with the repair of a centrifugal pump using Sifbronze low-temperature welding.

JOHN HARPER & COMPANY, LIMITED, Albion Works, Willenhall (Staffs)—The wide range of castings produced by this old-established firm is outlined in an attractive brochure, which contains many photographs of examples of the company's products. Also now published is a pamphlet on Harper-Quiet May automatic oil-fired boiler/burner units for central heating and hot-water supply.

ALUMINIUM DEVELOPMENT ASSOCIATION, 33, Grosvenor Street, London, W.1—The March issue of the Aluminium Courier, which was published in mid-July, is presented in a new format and the cost is now 2s. 6d. The changes all round make for more attractive presentation. "Aluminium in Telecommunications" and "All-welded Aluminium Superstructures" are among the articles in the March issue.

WILD-BARFIELD ELECTRIC FURNACES, LIMITED, Elecfurn Works, Otterspool Way, Watford By-pass, Watford (Herts)—A 30-page booklet deals with "Laboratory Muffles and Small Furnaces," while pamphlets have also been issued dealing with gas carburizing and carbonitriding processes, shaker-hearth furnaces for continuous controlled hardening, and A.H.F. 2½ kW. induction heating equipment.

DAVID BROWN INDUSTRIES, LIMITED, Park Works, Huddersfield—A reproduction of the drawing of Mr. David Brown, the chairman and managing director, that appeared in our sister publication, *The Foundry Trade Journal*, accompanies a centenary message from Mr. Brown in the July-September issue of the company's Newsletter. In addition, there is "The David Brown Story" and many other technical articles and features of a general character in this excellent magazine.

Iron and Steel Statistics

WHILE the volume is on similar lines to past issues, the latest edition of the British Iron and Steel Federation's "Iron and Steel Annual Statistics," relating to the year 1959, includes several additional and useful tables.

The subjects covered by the new tables are:—Oxygen consumed by the industry; fuel consumption (a comprehensive table showing the various fuels consumed by the industry in terms of therms); pig-iron (this table shows in more convenient form details of the supply and consumption of pig-iron previously recorded in separate tables); steel conversion factors; accident frequency rates in the iron and steel industry; capital expenditure.

FORTHCOMING EVENTS

AUGUST 4

North of England Institute of Mining and Mechanical Engineers:—Meeting in the Lecture Theatre, Neville Hall, Newcastle-upon-Tyne 1, at 2.30 p.m. "The Mining and Geological Implications of Recent Geophysical Surveying of the Undersea Areas of the Northumberland, Durham, and Cumberland Coalfields," by M. Clark and D. McGraw.

AUGUST 16

Institute of Metals:—Meeting at 17, Belgrave Square, London, S.W.1, at 6.30 p.m. "The Physical Nature of Plastic Flow," by Dr. J. J. Gilman, of the Research Laboratory, General Electric Company, Schenectady, USA.

Self-agglomerating Fluidized-bed Reduction

Treatment of Fine Iron Concentrates from Low-grade Ores

Whether self-agglomerating fluidized-bed reduction is the answer to the economic treatment of fine iron concentrated from low-grade iron ores is the subject of a paper by B. G. Langston and F. M. Stephens, Jun., of the Battelle Memorial Institute, presented at the 1960 American Institute of Metallurgical Engineers' Blast Furnace, Coke Oven, and Raw Materials Conference. The authors believe that data obtained from experimental work on the direct reduction of finely ground iron concentrates with hydrogen has demonstrated a mechanism which utilizes the adhesive characteristics of the particles in a fluidized bed for the production of agglomerated particles of a controlled size. A summary of the paper, which was published in the April, 1960, issue of the Journal of Metals, follows.

TO permit utilization of low-grade iron-ore resources an efficient system is required to beneficiate the ore to a grade sufficiently high for the concentrates to be used economically. Because of their mineralogical texture, both the jaspers in Michigan and the taconites in Minnesota require fine grinding to liberate the iron values. Having developed beneficiation to produce a concentrate of an acceptable grade, one is still faced with agglomeration to produce a product of a size acceptable to blast-furnace operators. Pelletizing and sintering are satisfactory but costly. Fine particle size of a concentrate, it has long been recognized, could be an advantage in obtaining high rates of reduction to metallic iron. Thus, if it were possible to take advantage of the fine particle size and, at the same time, directly convert large tonnages of concentrate to metallic iron in relatively small units, it might be advantageous.

Many attempts have been made to develop methods for the direct reduction of iron oxides to metallic iron. Crude ore amenable to concentration at a coarse particle size or pelletized concentrates can be treated in kilns, shafts, or retorts. But of the types of equipment available the fluidized bed has shown the greatest promise for the direct production of iron from finely divided material, such as concentrates produced from low-grade iron ores. The main advantages are excellent gas-solid contact and temperature control.

Normal fluidized-bed reactors, however, have several disadvantages. The volume of gas that can be passed through the reactor is a function of the gas velocity that can be used without entraining the finely-divided solids and, in turn, the amount of material that can be treated is dependent on how much reducing gas can be passed through the reactor. Because of these limitations imposed by the gas phase, it is interesting to examine the role of the gas phase in the reduction of iron oxides to metallic iron.

Reference to the chemical equilibrium data for the systems $Fe\text{-}H_2\text{-}O_2$ and $Fe\text{-}C\text{-}O_2$ shows some interesting relationships. Fig. 1 gives the basic equilibrium curves for these systems and shows

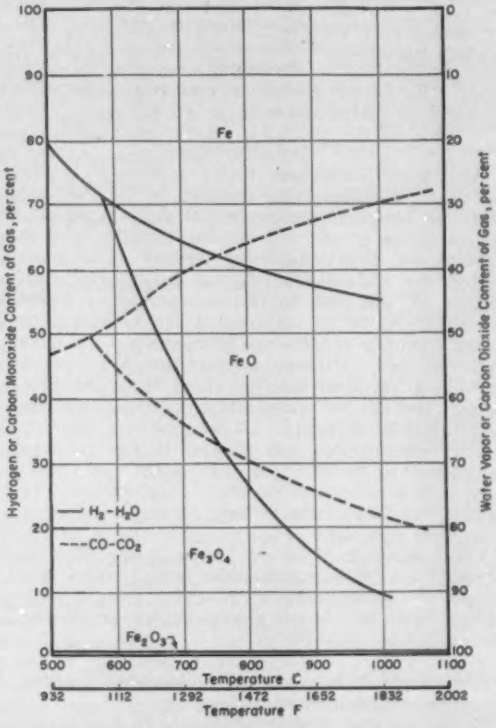


FIG. 1.—FLUIDIZED BED REDUCTION.

that, in reducing Fe_2O_3 or Fe_3O_4 to metallic iron with either CO or H_2, less than half the reducing gas can react without encountering a reversal of the reaction. This means that to obtain complete reduction of iron oxides to metallic iron, gas flows considerably in excess of stoichiometric requirements are needed.

Another consideration is the rate of ferric oxide reduction to either magnetite or to metallic iron. While there is some difference of opinion as to the controlling mechanisms, there appears to be agreement that, within a given set of conditions, the rate of reduction is inversely proportional to particle size. Thus, the finer the particles, the more rapid the reduction rate; but, on the other hand, the finer the particle size, the lower the gas velocity that can be tolerated in a fluidized bed. This calls for a compromise between rapid reaction rates and the ability to use large volumes of reducing gas to obtain high capacities. Operation of a unit under pressure offers some promise of increasing gas volume, but this increases capital cost.

Considerations of equilibrium indicate that ferric oxides can be reduced to metallic iron at relatively low temperatures; kinetic considerations, however, indicate that elevated temperatures are required to obtain reductions in reasonable lengths of time. On this basis, it would appear that, because higher capacities could be obtained with higher temperatures, it would be desirable to operate reactors at the highest possible temperatures. But there are other aspects of operating at elevated temperatures.

Two Alternatives

The most important factor probably is the physical condition of the material in the fluidized bed. At temperatures above 760 deg. C., metallic iron becomes plastic and the fine particles tend to agglomerate, thus defluidizing the bed. Two alternatives are available to improve the physical conditions of the bed:— (1) to operate at lower temperatures; or (2) to control the reduction to avoid complete reduction. Both alternatives have disadvantages. If lower temperatures are used, a pyrophoric product results which must be processed further by compacting or heat-treating. If incomplete reduction is used, the end product has a more limited use than if it was reduced completely to metallic iron. In either case, however, it is necessary to maintain close temperature control not only of the average charge, but also of individual particles.

The fundamentals of fluidized-bed operation in relation to iron-ore reduction having been discussed, it is interesting to compare these fundamentals and to choose the preferred conditions for operation:—

Feed Size.—As coarse as possible to allow maximum gas flows, but as fine as possible to allow maximum reaction rates.

Temperatures.—Above 760 deg. C. to give maximum reaction rates and to produce a non-pyrophoric product, but below that temperature to avoid sticking and defluidization of the bed.

Gas Velocities.—As high as possible to give the maximum amount of reductant and high heat transfer rates, but as low as possible to avoid entrainment and dust carry-over.

In considering these conditions, it becomes obvious that the ideal system would be one that could operate at elevated temperatures with finely-divided feed at a high unit capacity in unpressurized equipment, while producing an agglomerated end product which is non-pyrophoric. The present paper describes the development of such a process and presents some of the data obtained from a research programme which has been carried out to demonstrate the basic concepts of the process.

The proposed process is carried out in a modified fluid bed in which the fine feed is self-agglomerating, this permitting the use of high gas velocities resulting in high-unit capacities at low pressures. The known phenomenon that freshly reduced metallic iron softens and becomes sticky at high temperatures is used to agglomerate the fine feed and produce an agglomerated, non-pyrophoric end product. At the same time, because the reduction of finely divided iron oxide occurs only at the surface of the agglomerates, rapid reaction rates can be maintained.

Self-agglomeration in Fluidized Bed

In any fluidized-bed system the particles being fluidized are constantly in motion and undergo a continuing series of contacts with each other. Thus, it is normally difficult or impossible to fluidize any material which becomes sticky or soft while being treated. The tendency for particles to stick together when they collide depends on three factors:— A, their adhesive properties; B, the area of contact; and C, their momentum. The tendency to stick is directly proportional to the adhesive force and area of contact and inversely proportional to their momentum. Thus, stickiness, $S = f\left(\frac{A \times B}{C}\right)$.

In a system containing only three small particles which are soft or semi-molten, the adhesive force and area of contact are relatively large, while the momentum is small because of the large surface area to mass ratio of the particles. Thus, the entire bed tends to fuse or stick into a single mass. On the other hand, it is possible to control this stickiness or fusion by controlling the adhesive properties and by increasing the size of the particles being fluidized.

In the system where iron oxides are being converted to metallic iron, only the metallic iron is plastic or sticky. The degree of plasticity and, therefore, the adhesive force is dependent on the temperature. The momentum and relative area of contact can be controlled by varying the gas velocity and particle size. Since in a normal fluidized-bed reactor the fluidized material is practically the same as the finished product, only the size of the reduced iron particles requires control.

Thus, it would be possible to fluidize metallic iron pellets of, say, ¼ in. dia. at temperatures higher than could be used for −100-mesh particles. At the same time, although the larger particles would not adhere together because of their limited area of contact and high momentum, they would still exhibit a relatively adhesive surface which could capture fine particles passing through the bed.

It is, therefore, possible to feed finely divided iron-oxide particles to a bed of pelletized iron, the fine oxide adhering to the surface of the larger pellets, thereby causing them to grow in size through self-agglomeration of the fine feed.

Several other phenomena are believed to aid the system during this growth cycle. First, only a limited layer of iron oxide can be collected on the surface of the reduced pellet without causing the surface to be completely covered with a non-plastic iron-oxide coating which can no longer capture fresh feed particles until the iron-oxide layer is reduced to metallic iron. Thus, the actual reducing reaction takes place only at the surface of the pellet and does not require diffusion of the hydrogen into the centre of the pellet nor diffusion of water vapour from its centre. This surface reduction is, therefore, much more rapid than a similar reaction would be if pellets made up completely of iron oxide were being reduced.

Secondly, once the pellets have grown to a sufficient size so that they become less easily fluidized they tend to segregate to the bottom of the bed where they can be withdraw as a finished product of controlled size.

Finally, there is evidence to support the belief that during the reaction a minor number of finely divided feed particles are reduced to metallic iron in the gas stream without being attached to the larger pellets. Futhermore, these particles, because of their large surface area to mass ratio, tend to bond to other small feed particles and thus form nuclei for perpetuating the grain growth of self-agglomeration.

Importance of Particle Size

The permissable gas velocity through a fluidized-bed reactor is largely controlled by the size of the particles. If the velocity exceeds the entrainment velocity the particles in the bed will not remain fluidized, but will be entrained and carried out with the gas. Stokes' law shows that doubling the particle size permits the use of a gas velocity four times as high as could be tolerated for the smaller particle. Or in the case of fine iron-ore concentrates which are essentially −100-mesh or less than 0.015 cm. dia., only 1/400 of the gas velocity used with ¼-in. pellets (0.32 cm.) could be used for fluidization. Because the amount of iron oxide that can be reduced to metal is primarily dependent on the amount of reducing gas that can be passed through the unit, it is theoretically possible to reduce 400 times as much iron oxide in a given unit when treating ¼-in. pellets as could be reduced when treating −100-mesh particles. To obtain the same result by increasing the gas pressure would require the unit to operate under a pressure of 400 atm or approximately 6,000 lb./sq. in.

Fine iron-oxide concentrates which are completely reduced to metallic iron at temperatures below the softening point of iron exhibit a tendency, even after careful cooling, to be pyrophoric and to re-oxidize with a violent and almost instantaneous reaction on exposure to air.

On the other hand, iron oxide reduced above its softening point is quite inert when cooled and exposed to air. Thus, the self-agglomerating process operating at an elevated temperature produces a product that is easily handled and stored, even though it is completely reduced to a metallic state. This simplifies handling the material and eliminates the need for briquetting or compacting the product in an inert atmosphere. If compaction is required, for instance to improve electric furnace operation, it would be simple and inexpensive using non-pyrophoric material.

Results of Experimental Work

Particle Size Distribution.—During the development of the process, many experiments were run on several different types of feed material under a variety of conditions. In this paper, typical data are presented to verify the basic concepts of the process as already described.

The outstanding feature of the process is the mechanism which gives adhesive properties to the particles, at the same time, permitting fluidization of the bed. This mechanism was demonstrated by analysing the data obtained from experiments using a starter bed of a predetermined particle size and an iron-oxide concentrate which was over 90 per cent. −325-mesh as feed to a fluidized-bed reactor.

The non-fluidizable starter bed contained approximately 96 per cent. of the weight and 97 per cent. of the surface area in the −40-mesh fractions. By comparison, in the fluidizable mixture there was 37 per cent. of the weight and 55 per cent. of the surface area in the −40-mesh fractions. Although −40-mesh has been used as the size fraction for purposes of discussing these particular starter beds, the important factor is the relation between the mass and adhesive force of the coarser particles and that of the smaller fractions.

The fact that the coarser starter bed could be fluidized at temperatures as high as 870 deg. C., whereas the other bed defluidized at 750 deg C., is in accordance with the concept that the tendency to stick is directly proportional to the adhesive force and area of contact, and inversely proportional to the momentum.

Particle Growth.—Another interesting theory is the relationship between surface area of the particles in the bed and the agglomeration of the iron-ore concentrates fed to the fluidized-bed reactor. If the concepts pertaining to the factors which cause bed stickiness are valid, the fresh

feed should be agglomerated to the bed particles in direct proportion to their surface area. To demonstrate the validity of this concept, the weight gained by the fluidized-bed charge during an experiment at 850 deg. C. was distributed to each size fraction in the starter bed in proportion to the surface area of the particles in each size fraction, and a screen analysis was calculated for the product. A comparison of particle size distribution of the synthetic starter bed with the calculated and actual distribution of particle sizes obtained experimentally, revealed a close correlation between the actual and calculated values. These and other similar experimental data tend to confirm the validity of the premise that growth of particles takes place as a function of their surface area.

Regarding the physical structure of particles, the fact that in a bed these grow in relation to their surface area supports the theory that reduction of the iron oxide takes place at the surface of the coarser pellets. That the system has this property was shown by examination of the data obtained from a series of experiments in which the unit was periodically shut down, the bed discharged, the oversize and undersize material removed, and the balance of the bed material recycled.

Factors Controlling Feed Capture

The system's ability to capture and retain feed has been shown to be dependent on the adhesive force and on the surface area. In addition, because capture is a function of probability, bed depth is also a factor. To be captured, a feed particle must first contact a pellet surface. The probability of this occurring is a function of gas velocity and bed depth. Secondly, the surface contacted must be one which will accept the feed particle. This means that it must be a metallic iron surface and must be at a temperature sufficiently high to have the adhesive force necessary to hold the particle. To date no exact data are available to set limits or predict design data for determining optimum reactor size to give maximum feed capture. However, some interesting data are available which give an indication that these factors lie within reasonable limits. For example, capture rates of over 75 per cent. have been achieved in beds 6 in. deep operating at 850 to 870 deg. C. and capture rates of over 95 per cent. have been obtained in beds 3 ft. deep at about 800 deg. C.

General Considerations

In the small-scale work used to demonstrate the self-agglomeration process, the objective was to produce material in the size range −12 +20-mesh by direct reduction of −325-mesh iron concentrates. To maintain fluidization of the bed at 850 deg. C. and to agglomerate the iron concentrates to this size required a superficial gas velocity of 10 ft./sec. The process was demonstrated under conditions resulting in the production of −6-mesh +8-mesh pellets of reduced iron concentrates. A superficial gas velocity of 35 ft./ sec. was required for fluidization of the self-agglomerating bed.

It is believed that the economics of pumping and recycling the reductant is the limiting factor as to the maximum particle size that can be produced by the self-agglomerating fluidized-bed reactor. With the proper starter bed and space velocity, it is believed that ¼-in. pellets might be produced by this process. Finally, in every experiment at temperatures in the range 750 to 870 deg. C., the agglomerated product from the fluidized-bed reactor was non-pyrophoric and assayed over 98 per cent. metallic Fe.

Venezuelan Steel Company's Expansion

SCHEME in announced to expand, modernize, and diversify the steel production of Siderurgica Venezolana, S.A. (SIVENSA), with the aid of an International Finance Corporation investment of US $3,000,000.

SIVENSA, which was founded in Venezuela in 1948, operates a semi-integrated steel mill producing reinforcing bars and wire rods, most of which are used in the construction industry. The basic raw material is domestic scrap converted into ingots by the electric furnace method. Steel requirements are supplemented by imported billets. SIVENSA is a Venezuelan-owned and managed company, the shares being traded on local stock exchanges and distributed among several hundred shareholders.

The IFC investment will help finance a large-scale programme designed primarily to reduce manufacturing costs, to upgrade and diversify the products, and to increase rolling capacity from 60,000 tons to more than 90,000 tons annually. This programme was started in 1958 and is expected to be completed this year. It involves the following operations:— (1) Arranging a more dependable and economical supply of steel scrap; (2) rebuilding and modifying rolling mills and auxiliary facilities; (3) building a large-capacity re-heating furnace; (4) improving transportation and material handling facilities; (5) improving plant and office facilities. Total cost of the programme, including working capital, is estimated at US $6,200,000 equivalent. Additional financing is being provided by a loan from the Corporation Venezolana de Fomento and by an increase of share capital and retention of earnings.

DR. J. J. GILMAN, of the Research Laboratory, General Electric Company, Schenectady, USA, is to give a lecture on "The Physical Nature of Plastic Flow" under the auspices of the Metal Physics Committee of the Institute of Metals. The meeting will take place at the institute's headquarters, 17, Belgrave Square, London, S.W.1, at 6.30 p.m. on August 16. Visitors will be welcomed and tickets are not required.

Metallurgical Progress

Some abstracts from recent reports on research and development, at home and abroad

New Precipitation-hardening Stainless Alloy. E. A. SCHAEFER. (Iron Age: 1960; Vol. 185; No. 10; pp. 126-8). It is claimed that this alloy has high strength and good corrosion resistance. Other advantages include good ductility when hardened, improved resistance to galling, good machinability in both water-quenched and annealed conditions, high weldability with no danger of intergranular corrosion, and can be easily cast using normal foundry techniques. The composition of the alloy is C 0.040 max., Mn 1.0 max., Si 1.0 max., P 0.04 max., S 0.04 max., Cr 25.0 to 27.0, Ni 4.75 to 6.0, Mo 1.75 to 2.25, Cu 2.75 to 3.25 per cent. Most castings, of normal section thickness, require a two-step heat-treatment. Firstly, the castings are solution annealed by water quenching from about 1,100 deg. C., which develops maximum corrosion resistance. Secondly, the alloy is aged for 3 hr. in a temperature range of 450 to 510 deg. C. The alloy has a two-phase austenite-ferrite structure in the as-cast condition. Sigma phase appears in the fully hardened alloy as scattered particles in the ferrite matrix. The alloy can be machined readily in either the water-quenched or aged condition, but the best results are obtained by machining in the solution-annealed condition. As the alloy has excellent chip characteristics and does not work-harden, very close tolerances can be maintained.

High-strength Bearing Bolts. ANON. (Iron Age: 1960; Vol. 185; No. 10; pp. 132-3). Rows of spiral grooves on the upper tank of a new structural bolt produce a very tight fit, which ensures high shear resistance. Each bolt shank has rows of knurls set on a spiral to reduce the driving load. The length of the knurled body is determined by the thickness of the members to be joined. The front of each knurl is ball-shaped to permit easy driving. Between each row of knurls there is a relief, which prevents packing of foreign or displaced matter during driving, and they act as a buttress after impaling the connected joints in a hooking action. Bolt heads resemble upset rivet heads—except for small flats across their tops. The flats permit driving, with an impact tool or a hammer. The lower end of the bolt shank has standard coarse threads. The bolt length allows room for a washer under the nut. Washers under the bolt head are not needed due to the head's wide bearing surface. The loading torque induces a clamping pressure on the joint through friction between the connected beams. The resulting friction resists slipping of the connected members themselves. Thus, the friction, coupled with the hooking action of the knurl reliefs, does away with all slippage under normal conditions. Tests show that men with little experience can place 350 bolts per man in an eight-hour shift. In a research report it was stated that little or no slip occurred in the connections under tensile loading of 30,000 lb./sq. in. on the net section. These bolts have been developed by Lamson & Sessions & Company, Cleveland.

The Safe Use of Oxygen in the Steel Industry. R. E. ARMSTRONG. (Steel: 1960; Vol. 146; No. 9; pp. 88-90). The increasing use of oxygen in steel plants calls for a closer look at the safety regulations. Flow rates through a single orifice have been boosted from 6,000 cub. ft./hr. to 10,000 cub. ft./min. Separators or strainers in old lines are removed sometimes or by-passed to increase the oxygen flow. Some new lines are installed without adequate filters. Small particles of scale can cause trouble in lines carrying the gas at high velocities. Oxygen pipe used in auxiliary burners must be cleaned carefully during manufacture and maintenance, and a caustic cleaning solution is recommended. Piping should be tested for leaks at 1.5 times its maximum operating pressure with oil-free compressed air or nitrogen. Oxygen lines should be inspected daily for breaks, leaks, or grease and oil saturation. Precautions must be taken to prevent liquid fuel from dripping into the oxygen line. Water-cooled lances must be kept above the surface of the bath. Violent eruptions can occur if the lance tip is damaged and water is forced under the molten metal. Safety rules must be followed in the installation, use, and servicing of open-hearth roof jets. Platforms with closed sides will give workers an escape path on the furnace roof. The expanded-metal floor of the platform is usually 4 to 6 in. above the furnace roof; graphite between the roof and platform is removed periodically. Jet maintenance should be done from this platform.

Profile Check at Hot Mill Ensures Quality Strip. ANON. (Steel: 1960; Vol. 196; No. 7; p. 128). A recording profilometer helps to ensure high edge-to-edge surface quality on strip coming from an 8-ft. hot mill at Great Lakes Steel Corporation, Detroit. This company constantly checks the gauge of hot-rolled steel with X-ray gauges, but the longitudinal path of the gauge does not allow edge-to-edge examination without stopping the mill. The profilometer recorder has a pick-up which drives along the edge of sample strips cut from the hot bands as they come from the mill. The instrument produces a continuous transverse profile of the strip in 60 to 90 sec. Each sample (a 4-in. edge-to-edge segment of the strip) is cut from the hot band and chilled in water. It is taken to the laboratory, situated near the mill, and checked with the profilometer to see if the crown and surface are within specification. A variation of 0.003 in. on strip 0.90 in. thick is outside tolerance. The roll operator is informed of any ridges which are forming and

he can then check the rolls and sprays to correct the abnormal conditions.

Low-Sulphur Steelmaking. H. W. McQUAID. (Iron Age: 1960; Vol. 185; No. 7; pp. 114-6). The rotary reactor is a cylindrically shaped drum open at each end. Hot metal pours into the drum at one end and is forced to move through it by a shoulder at this end of the drum. A gas burner is positioned at the other end. The drum is revolved at a high speed by supporting rollers. Centrifugal force spreads the incoming metal in a thin layer over the drum's inside surface, and coats it under pressure with the desired reagent. The thin layer of exposed molten metal is ideally spread for rapid and thorough chemical reaction. Once exposed to the chemical agents required to remove silicon and sulphur, the total reaction time may not exceed 10 to 20 sec. In removing sulphur alone by combination with strong alkalies, the hot-metal temperature drops only 24 deg. C. When oxygen and iron oxide are added to remove silicon some heat results. The resultant hot metal is ready for transfer to either the open-hearth or an electric furnace. The chemical reactions in the removal of sulphur are fast and complex. With a 60-ton/hr. unit, the silicon content was reduced 69 per cent., and the phosphorus content 28 per cent. In tests, the sulphur content of 0.10 per cent. was reduced to 0.02 per cent. in one or two minutes. Using caustic soda, the sulphur could be brought down to 0.002 per cent.

Celluloid Replicas Aid the Study of Metal Fractures. K. KORNFELD. (Metal Progress: 1960; Vol. 77; No. 1; pp. 131-2). Macrofractography has proved to be a useful laboratory tool because the fracture appearance often points to the cause of failure. To overcome the difficulty of specimen illumination and the laborious positioning of the fractures under the microscope, a replica technique has been developed which can produce good specimens. Replicas of fractures are made from a solution of celluloid (cellulose nitrate) in methyl acetate which bonds the fracture to a celluloid strip. When the solution dries, the strip, which now contains a reproduction of the fracture, can be peeled from the specimen. Any hand press may serve the purpose of making replicas. A flat piece of rubber about 0.75 in. thick is put on the press table and covered with clean paper on which a strip of celluloid of the required size is positioned. The celluloid should be 0.002 to 0.006 in. thick. When the "rubber die" and celluloid sheet are ready, the methyl-acetate solution is applied to the fracture and the sample is quickly positioned (within 1 to 5 sec.), fracture surface down, on the celluloid. Sufficient pressure is applied to cause a small indentation in the rubber. Pressure should be maintained for 2 to 3 min. After removal from the press, the replica will harden in about 5 min. Then it can be gently stripped from the fracture surface.

Steel Castings for High-duty Applications. H. E. HUBSCHER. (Metal Progress: 1960; Vol. 77; No. 1; pp. 77-81). Steel castings which have uniform properties in all directions are now being made in Switzerland. By virtue of alloying and heat-treatment, these properties can include tensile strengths as high as 190,000 lb./sq. in., and excellent resistance to cavitation and to corrosion by various chemicals. The melting shop at George Fischer, Limited, has four basic-lined electric-arc furnaces, ranging from 8 to 30 tons capacity. All have a swinging roof for top charging and the 30-ton furnace is equipped with a magnetic-stirring device. Induction furnaces with capacities from 1,000 to 3,000 lb. are available for making small castings, especially in high-alloy steels with low carbon. Castings for aircraft are mainly for parts of the landing gear, most of them made of chromium-molybdenum steel (1 per cent. Cr, and 0.03 per cent. Mo) and heat treated for tensile strengths in the range of 100,000 to 175,000 lb./sq. in. Experience has shown that, besides the correct heat treatment, the sulphur content of the low-alloy, high-tensile steels must be low, *i.e.*, 0.01 per cent.

Plastic-powder Coating Dresses Up Metal Parts. ANON. (Steel: 1960; Vol. 146; No. 10; pp. 82-3). Fluidized-bed coating of metals employs no solvents and uses finely-divided resin particles suspended by fluidization with gas or air in an enclosed tank. The advantages reported include the ability to use solvent-resistant plastics such as nylon, good coverage of sharp edges and corners, a smooth surface, and the formation of heavy coatings (0.005 to 0.050 in.) with a single immersion of the part. The parts are preheated, then dipped in the fluidized bed of resins. Control of the nature of the bed depends on many factors including particle size of the material to be suspended, the required fineness of the powder before the bed can be formed, air or gas velocity, and the densities of the particles and the gas. A continuous-preheating oven is used, and the temperature of the metal is higher than the melting range of the plastic used for the coating. The preheated parts are removed from the oven and are moved backwards and forwards in the bed to get uniform coatings. The thickness of the coating can be determined by adjustment of the temperature of the part and the time of immersion. A uniform 10 mil. coating is applied by a single dip, and post-heating fuses the powder particles into a smooth, continuous coating. Both thermosetting and thermoplastic polymers can be applied.

Vacuum Treatment of Molten Steel in Germany. P. J. WOODING and W. SIECKMAN. (Metal Progress: 1960; Vol. 77; No. 1; pp. 116-22). This treatment was developed by Dortmund-Hörder Hüttenunion, the process being applicable to electric furnace, open-hearth, and oxygen-converter production. It operates on the basic principle of forcing successive portions of liquid steel into a vacuum vessel by atmospheric pressure. Carbon, hydrogen, and oxygen are removed by these reactions. Carbon can be reduced to a minimum without an undesirable increase in oxygen contamination, and furnace

refining time for low-carbon steel can be shortened. When the amount of hydrogen is lowered, conventional slow-cooling practices can be decreased or eliminated. Also, reduced delivery time is permitted. Significant quantities of oxygen can be removed rapidly only if the oxygen is "free" and not in compound form. Therefore, it is desirable to degas the steel before adding elements with a high affinity for oxygen. By making such additions late in the degassing cycle, it is possible to remove most of the "free" oxygen as a gaseous deoxidation product and to flush out the hydrogen. DHHU has developed a vacuum-treatment unit which does not interfere with normal operations and is independent of ingot size. The unit produces steel which is excellent in terms of improved cleanliness, hydrogen reduction, and yield. This process makes it possible to select the most advantageous time for alloying additions, and to avoid detrimental superheating of the open-hearth bath. Five years' development and a production of over 75,000 tons have led to a process which has general application and considerable further potential. Acceptance has been rapid in the United States.

THE ADDISON WIRE TEMPERATURE METER

EFFICIENT operational control in wire mills is at present limited by the lack of an accurate device for measuring wire temperature. If full advantage is to be taken of the higher drawing speeds that engineering and electrical machine design now make possible, it is necessary to ensure that the temperature of the wire, as it is drawn through the dies, does not rise so high that the properties of the wire or of the lubricant are impaired.

With a suitable temperature-measuring instrument the maximum drawing speeds can be quickly established for various steel qualities and for different drafting schedules. The instrument could be the basis of future systems of automation and process control in wire-drawing mills, and could also be used for measuring the temperature of wire during heat treatment and in "in-line" cleaning and coating.

A reliable instrument has recently been developed for this purpose by the Addison Electric Company, Limited, 10/12, Bosworth Road, London, W.10, in collaboration with BISRA. In the Addison meter a reading is obtained by pressing two pulleys, made of different metals forming a thermocouple, against the moving wire. The signal generated is passed through contacting brushes on the pulleys, and a connecting lead, to the measuring unit. The meter has been specifically designed for the rapid temperature measurement of moving wire and the response time is normally only 5-10 sec. The temperature is indicated directly on a calibrated scale in the measuring unit.

The instrument has been calibrated, on a special rig developed by BISRA, over a speed range of 50-3,000 ft./min., a temperature range of 50-300 deg. C., and wire sizes from 9-16 s.w.g. The meter reading is independent of wire size and speed over the ranges tested. Accuracy is ± 5 deg. C., which is considered to be adequate for industrial needs.

The calibration is not affected by the type of phosphate coating normally used for the drawing of high-carbon steel wire and theoretically there are no reasons why it should be affected by tin or zinc coatings provided there is no temperature difference in the wire between the contact points on the pulleys. The problem of temperature measurement on heavily soaped wire, where it has been found that the soap transferred to the pulleys may act as an insulator, thus preventing more than one reading without cleaning, has been overcome by fitting paraffin impregnated pads that are spring loaded on to the pulleys: in this way a clean surface is always presented to the pulleys.

The Addison contact meter has proved itself in the laboratory and in industrial wire mills during extensive experimental studies. Preparation for use, by zero setting and adjustment for ambient temperature, is easy and takes less than half a minute, and the only other precaution needed is to ensure that the pulleys are clean and that the pads are impregnated with paraffin.

The instrument is of robust construction, and the measuring unit, containing the meter, is self-contained in a case approximately 10½ in. by 4½ in. and weighs just over 5 lb. An optional extra is an ever-ready leather case with a strap so that the instrument can be slung from the neck during use. The market price is £110.

Stainless Steel Review

Latest in the special review numbers of the Metal Bulletin is concerned with stainless steel. It contains many authoritative articles on the overall uses of stainless steel in various industries, surveys on an area basis, a world list of producers, with details of their products, and many illustrations and statistics of production. The cost of the review is 10s., post free, and it may be obtained from the Metal Bulletin, Birkett House, 27, Albemarle Street, London, W.1.

Quick-reference Welding Charts

First in a new series of Sifbronze welding data and instruction charts has been published by the Suffolk Iron Foundry (1920), Limited, Stowmarket (Suffolk), price 1s. 6d., post free. This quick-reference chart gives, against all the commercial metals in general use listed in alphabetical order, the weld preparation details, melting point, filler rods, fluxing, flame setting, weld technique, and other important factors of interest to small welders. Measuring 24 in. by 20 in., the chart is printed in two colours on stout card-paper and is suitable for mounting on plywood or hardboard.

British and World Shipbuilding

LLOYD'S REGISTER RETURNS FOR JUNE QUARTER

STEAMSHIPS and motorships under construction in Great Britain and Northern Ireland at the end of June, according to Lloyd's Register Shipbuilding Returns for the quarter ended June 30, 1960, totalled 261 ships of 1,866,288 tons gross. This is 94,363 tons less than the previous quarter and is the lowest figure since September, 1946. The total comprises 88 ships of 599,923 tons fitting out afloat, and 173 of 1,266,365 tons still to be launched.

Vessels under construction included 53 steamships of 990,190 tons and 208 motorships of 876,098 tons. In other Commonwealth countries there were under construction 11 steamers of 123,361 tons and 34 motorships of 106,342 tons. Oil tankers building in Great Britain and Northern Ireland totalled 55 ships of 895,175 tons, which is 95,051 tons less than the March quarter, and represents 48.0 per cent. of the total tonnage under construction in this country. Total construction in the principal districts is shown in Table 1.

TABLE 1.—*Shipbuilding Construction in Hand in Principal Districts of Great Britain and Northern Ireland.*

District.	June 30, 1960.		March 31, 1960.		June 30, 1959.	
	No.	Gross tonnage.	No.	Gross tonnage.	No.	Gross tonnage.
Aberdeen ..	19	9,236	18	8,869	17	24,361
Barrow ..	3	92,500	3	92,500	2	67,500
Belfast ..	12	217,762	15	282,840	15	293,953
Bristol ..	4	2,830	3	2,250	1	3,500
Clyde:						
Glasgow ..	51	464,720	53	490,113	46	452,914
Greenock ..	18	128,728	22	157,196	23	143,520
Dundee ..	4	22,744	4	14,158	6	40,514
Hartlepool ..	2	22,250	2	22,600	3	25,710
Hull	36	14,753	34	13,891	38	12,461
Leith	7	43,050	10	46,634	8	32,326
Liverpool ..	7	130,045	8	113,963	12	111,638
Middlesbrough	9	163,610	8	134,610	11	171,953
Newcastle-upon-Tyne	32	323,580	33	362,299	34	408,183
Southampton	11	10,979	12	11,216	7	11,064
Sunderland ..	23	214,114	21	199,018	24	215,489

The sizes of steamships and motorships under construction in Great Britain and Northern Ireland included the following:—100 to 500 tons, steam nil, motor (89); 500 to 1,000 tons, steam 2 (16); 1,000 to 2,000 tons, steam 7 (13); 2,000 to 4,000 tons, steam 3 (5); 4,000 to 6,000 tons, steam 1 (6); 6,000 to 8,000 tons, steam 2 (26); 8,000 to 10,000 tons, steam nil (17); 10,000 to 15,000 tons, steam 9 (32); 15,000 to 20,000 tons, steam 3 (2); 20,000 to 25,000 tons, steam 6 (2); 25,000 to 30,000 tons, steam 8 (nil); 30,000 to 40,000 tons, steam 7 (nil); 40,000 tons and above, steam 5 (nil).

Construction Abroad

Steamships and motorships under construction at the end of June totalled 1,203 ships of 7,257,887 tons gross, a decrease of 148,436 tons since last quarter. As was then the case, no returns are available for Communist China, East Germany, and Russia. Some of the leading countries abroad had the following tonnages under construction as compared with the previous quarter in parentheses:—Japan, 981,026 tons (+35,271); Germany (West), 929,826 tons (+1,371); Netherlands, 721,622 tons (−62,602); Sweden, 718,667 tons (+11,650); Italy, 717,247 tons (−4,503); USA, 619,457 tons (−69,295); France, 574,463 tons (−5,093); Norway, 308,268 tons (−20,500); Denmark, 288,026 tons (+44,605); Spain, 280,980 tons (−58,348); Poland, 260,156 tons (−4,757). It is noted that the tonnage under construction in Denmark is the highest ever recorded for that country, while Finland is at her lowest level since March, 1956. Because of the unsettled outlook for the shipbuilding industry in general, however, no special significance is attached to the variations shown for individual countries at this time.

Oil tankers under construction abroad totalled 188 ships of 3,463,438 tons, which is 198,496 tons less than the March quarter, and represents 47.7 per cent. of the total tonnage being built abroad. They include 19 of 477,210 tons gross under construction in Sweden; 28 of 460,420 tons in Italy; 19 of 406,919 tons in West Germany; 18 of 348,836 tons in the Netherlands; 23 of 345,800 tons in Japan; 12 of 322,208 tons in France; and 11 of 321,952 tons in the United States.

Apart from those countries in eastern Europe already mentioned, there are under construction in the world 1,464 steamships and motorships of 9,124,175 tons, of which 20.5 per cent. is being built in Great Britain and Northern Ireland. The present total is 242,799 tons less than the March quarter. Oil tankers under construction in the world amount to 243 ships of 4,358,613 tons (115 steamships of 3,193,508 tons and 128 motorships of 1,165,105 tons), which is 293,547 tons less than the previous quarter, and represents 47.8 per cent. of the total tonnage under construction in the world.

Of the steamships and motorships under construction throughout the world at the end of June, 4,900,147 tons (53.7 per cent.) are to be classed with Lloyd's Register. Of this total 1,838,869 tons, representing 98.5 per cent. of the tonnage being built there, are at yards in Great Britain and Northern Ireland.

TRAINING FOR MECHANIZATION

Presidential Address to Midland Colliery Managers

After a brief review of the changes which are taking place in the coal-mining industry today, Mr. T. R. Jameson, manager of Bentinck Colliery, No. 4 Area, East Midlands Divisional Coal Board, in his presidential address to the Midland Branch of the National Association of Colliery Managers on May 9, 1960, discussed the need to improve the training of both junior officials and juveniles entering the industry to match the development and use of more machinery in the mines. He also suggested that at every colliery, especially those undertaking a large-scale mechanization programme, a planning or progress engineer should be appointed.

MOST holders of colliery manager's certificate are members of the NACM and, according to the latest figures, there are about 3,000 members, the majority of whom are actively engaged in some way in the coal-mining industry. All carry heavy responsibilities, but none so great as the colliery manager and undermanager under the Coal Mines Act.

If responsibility is shared, so then is authority and any sharing of authority must carry the appropriate responsibility with it. A mine, according to the Coal Mines Act, must have a manager. He is in sole charge so far as the Act is concerned. He therefore has full authority and responsibility. This fact is not always appreciated or recognized. In a few cases, perhaps, managers themselves are to blame to some extent, but one thing is certain active membership of this association and of the BACM is a very sound support and guide.

We all know what is expected by the National Coal Board, it is a real task, worthy of any man.

By T. R. JAMESON

Bulk output is still required, but not at any price and not of any quality. Coal of the right quality, the right price, and at the right place and time is the gist of the "Revised Plan for Coal." To achieve this a start was made by coal stocking, coupled with a run-down in overall manpower. This was done without increasing unemployment.

The plan also embodies some pit closures and some redundancy. No one studying the scheme properly can fail to realize that a tremendous amount of thought and consultation has been put into its preparation and that a vital and important consideration has been kept constantly in mind; to achieve what is obviously necessary and at the same time avoid hardship as far as possible.

The aim is being reasonably well met, particularly in those districts most affected by closures, amalgamation of groups, etc., by allowing manpower wastage to take its course accelerated by compulsory retirement at 65 with generous financial assistance. Phasing of the closures and amalgamations, so that every opportunity is given to the affected persons to obtain other employment or to work in other collieries, is also helping to avoid hardship.

Some hardship will occur among all classes in the industry in certain places, but it is not likely to be so severe as some thought at first. Many members of this association can recall difficult times in the past due to industrial depressions and will also remember the hardship and poverty which they caused. All will agree that the present situation is being handled in a far more enlightened manner by the NCB.

So far as getting and loading of coal is concerned, very careful thinking will need to be given to every installation in order that the results required have a reasonable chance of success. Coupled with sound detailed planning and the sincere backing of all concerned, there is a very good future ahead for the industry as the country's main fuel supplier.

To become a going concern and to gain our necessary share of the fuel market, products of all grades and qualities must be sold. This is the testing time for the marketing organization of the industry, which appears to be tackling the problem with some vigour. It is up to all to do everything they can to assist—to be ambassadors and selling agents, to encourage the use of coal in every conceivable way.

Without doubt, competition will become keener, particularly if science makes further strides in the control and use of atomic power. How are we preparing for the medium- and long-term position?

Approach to Training

The positions can be influenced greatly by an imaginative approach to training. Training now lags behind mechanization. Mechanization by itself has produced results, but those results could have been better had it been possible to have had all coal-face operatives (the users of the equipment) trained up to the standard of present Grade II craftsmen.

This standard should be the immediate aim for all personnel handling and using equipment of all machines which today make up a very large

proportion of coal-face installations. It will not be very long before all faces are 100 per cent. mechanized and there is not the staff to handle and maintain this modern equipment to the best advantage. There is only one way to obtain them; that is suitably to train all workmen. The immediate aim of training should be to develop in the minds of the workmen and junior officials a greater sense of appreciation of the limits, the capabilities, and the high capital value of such equipment.

There are many power-loaded faces, equipped with hydraulic or powered supports, costing between £75,000 and £120,000, with only a deputy, an electrician, and a mechanic to maintain and supervise them on each producing shift. Such equipment often works in conditions, even in the best cases, which are far from ideal. Results will be better if training can catch up on installation. Knowledge breeds appreciation, and if a suitable standard of training can be attained, better and more effective use will result. There will be an improved recognition of values, both of capital involved and what can be achieved by proper operation and treatment. The basic training should be short, simple, and dramatic to illustrate the principles involved in the design and use of machinery and equipment.

Because of the rapidly increasing complexity of mining operations today, my plea is for more and better training and education of workmen to prevent abuses and breakdowns which are, very often, due to lack of knowledge.

Various courses for junior officials are playing their part, both for those "in post" and the "potentials." Some of them return to the pit stimulated and with a better idea of what is involved in their jobs, but with a less clear idea of how to achieve the best results. They would benefit more if their studies and time on the courses could be extended to go more deeply into human relations, work assessment, and work study, and the fundamental and basic principles of mechanical and electrical engineering.

A scheme on these lines has started in the East Midlands Division and it is hoped that it will spread and widen in scope.

Training Juveniles

There is a definite gap in the training of juveniles. I refer to those who we call the "holding trainees," lads who have had their pre-entry training course at the training centre, but have still to wait eight months before they can be allowed to work underground. These lads are the future backbone of the industry.

A great chance is being missed during this "holding" period to strengthen that future backbone. As it is now, it appears that this period in their industrial life is something of a bore and a burden to them, apart from a few highlights such as visits underground. During this period they lose the feeling of "belonging."

It is important that every effort be made to design a course for them which will keep them really interested and make them feel that what they are doing will be useful to them in the future. They might, for example, be allowed, under their instructors, the opportunity of doing useful jobs in workshops or repair departments, helping to strip down, clean, reassemble, and test machines and implements, particularly those which they may later be called upon to use.

If they could also be put through a well-planned course of instruction on the simpler basic principles of engineering it would pay dividends in the future.

It will not be very long before the great majority of coal-face workers will be "operators" of some sort of equipment. We must make sure that they understand and appreciate what they will be required to handle. In fact, before long, they will need to be technicians equal to the present level of mechanics and electricians of the mine.

Wider Scope for Planning

Every mine which justifies the appointment of an agent/manager should have its own unit planner, particularly if it is mechanized to any appreciable degree.

The main functions of this person would be:—(1) Liaison with the Area and group planners; (2) work in conjunction with the unit surveyor in connection with all working plans such as progress, ventilation, electrical, and special exemption details; (3) mechanization and progressing; (4) operational checking, work studies and analysis; (5) installation arrangements, tasks, norms, etc.; (6) materials and supplies; (7) statistics, costing, and maintenance.

It is important that all these categories should be given coherence by being directed and controlled from a unit planning department. I use the term "planner," but what is envisaged is someone who might eventually be called "unit organizational and planning engineer" or perhaps "colliery progress engineer."

Output and cost control, close budgeting, manpower control, etc., are matters which require to be very tightly applied today. Such an appointment is a necessity at every unit of the size which is prescribed above if the required control and results are going to be achieved.

The academic qualifications the planning engineer would require should be up to university mining diploma standard, with at least one term of practical training in planning, method study, mechanization, and wages and costing departments as a minimum. He must also be able to organize.

Interpretations of the Act and Regulations in recent successful prosecutions prove that the responsibility for all safety matters is carried by the senior unit management officials even though the incident was not solely their fault. Their wider experience and training make it their duty to do the thinking for those under them. Wider training of workmen and closer planning would help to obviate such happenings.

Consultation

Management, workmen, specialists, etc., depend upon the efficiency and wellbeing of the coal indus-

try for the security and improvement of our jobs. All of us, therefore, have the same common aim and this must be kept in mind at all levels of consultation. At no time should discussion on any subject be allowed to develop into a battle between opposing sides; there can be no sides if the foregoing is essentially true. There must be a genuine desire for co-operation from the start of every meeting, otherwise little or nothing will be achieved. Management carries practically all of the responsibility, and final decisions, therefore, rest upon its shoulders. But any decisions can be far more readily arrived at and far more easily carried through into successful operation if they have been preceded by active and co-operative consultation.

The industry's main competitor now is oil. In the future, providing a reasonable degree of international peace is maintained, oil will continue to be a strong rival. Atomic power is slow in its challenge, but there is no doubt that it will quicken. There also appears to be a rising challenge from imported liquid methane gas. How severe this may become remains to be seen.

There is very little doubt that in 20 years' time or less, at least 90 per cent. of all users of power, heat, and light will be supplied by means of cables or pipes. Whatever the means of distribution, the suppliers must have an original source of energy for their "generators." The coal industry's task is to make coal so competitive with every other fuel that it continues to be the main basic source of heat and power. If this can be achieved at home, a reasonable share in the export market ought to be possible.

Safety Valve for Powered Roof Supports

ADVANCING roof supports usually comprise support frames, each having at least two props, a floor bar, and a roof bar. A common source of hydraulic power is used for setting and advancing a number of support frames. A problem which has to be considered is the possibility of a fall of the roof above the rearmost prop in a frame, because the roof is caved immediately behind the frame. If there are, for example, two props in a frame and such a fall occurs, the roof supporting pressure in both props will be lost and the roof fall may become more general.

In a design evolved by Electro-Hydraulics, Limited, Liverpool Road, Warrington, this problem is overcome in a simple and economic manner, as shown in Fig. 1, which illustrates the hydraulic circuit for a support frame having a front and a rear prop. The hydraulic power supply is led to an inlet valve for setting both props. The pressure fluid passes direct to the rear prop and through a single non-return valve to the front prop. A pipeline from the front prop leads to an exhaust valve for releasing both props. A pressure-relief valve is fitted in parallel with the exhaust valve to allow yielding of the props under excessive load.

When the frame has been set to support the roof, both inlet and exhaust valve are closed. If the roof above the rear prop breaks away, pressure in this prop is lost. The non-return valve, however, prevents consequent loss of pressure in the front prop. It is most unlikely that a fall of roof will occur over the front prop which would cause loss of pressure in the front prop because the roof bar extends in front of and behind this prop. Such a fall would almost certainly occur also over the rear prop; consequently, it is not considered necessary to provide against a transfer of fluid from the rear prop to the front prop.

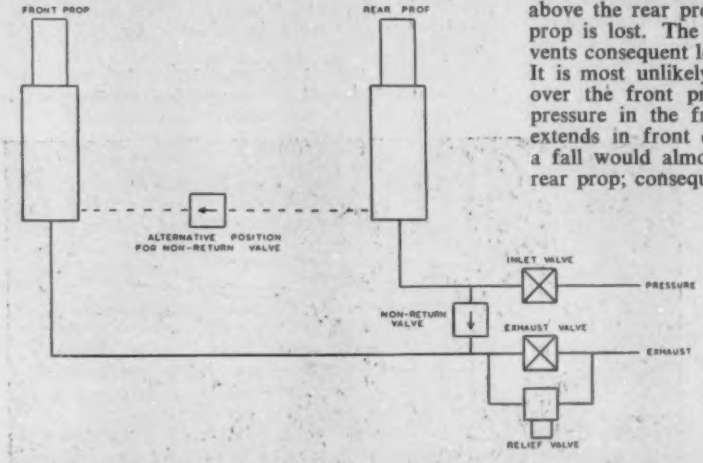


FIG. 1.—DIAGRAMMATIC CIRCUIT FOR A HYDRAULIC ROOF SUPPORTING UNIT, FITTED WITH A NON-RETURN VALVE TO PREVENT LOSS OF PRESSURE.

For each additional prop in a frame this system requires the addition of one non-return valve. If desired the one inlet valve and the exhaust valve can control the setting of two or more frames. In this case the inlet valve admits oil under pressure direct to the rear prop of each frame and the oil to the front prop of each frame passes through the single non-return valve.

BETTER GAUGE in

Metal Strip Production

EXPERIENCE at the first installation of a new device for automatically controlling the gauge of cold-metal strip which has been developed by the English Electric Company, Limited, shows that it makes several times the amount of gauge adjustment the operator normally makes by hand. Besides giving a more uniform product the device also indirectly increases production by freeing the operator from constant supervision of the gauge. He can change the coils more quickly and thus put more through the mill.

The device can be used for mills of any width, reversing or non-reversing, while it is also possible to combine it with the automatic slow-down equipment which English Electric has developed for slowing down a cold reversing mill at the ideal time for minimizing "thick end" waste. This is the third major automatic control device the company has produced for the steel industry in the last 18 months.

The other device is for the automatic programming of rolling operations.

Three mills in the Midlands have been fitted with automatic gauge control, one of them at the metals division of ICI at Witton, Birmingham. The three mills are rolling copper and brass for the motor-car industry. During this summer a mill at Firth-Vickers Stainless Steels, Limited, Sheffield, designed for rolling stainless steel strip up to 12 in. wide, is to be fitted with this device.

The system consists of a flying micrometer, a control panel, and the main control cubicle. The flying micrometer, mounted at the edge of the strip, measures the gauge of the rolled material. On a reversing mill a micrometer is mounted on each side of the rolls. The intended gauge is registered on the front of the micrometer. The operator sets up his tolerances on the control panel, which is conveniently mounted near the mill.

Generally, this is done by a multi-position switch, tolerances of $\frac{1}{4}$, $\frac{1}{2}$, 1, and $1\frac{1}{2}$ thousandths of an inch being typical figures. Others can be provided.

On automatic control a continuous signal is transmitted to the control cubicle. When the error is greater than two thirds of the tolerance setting, the screw-downs are operated and the distance between the rolls adjusted.

For a reversing mill the control cubicle contains three computing amplifiers, one for each of the two flying micrometers and one as a spare. The screw-down operation is initiated by high-speed contactors.

When the mill is rolling slowly, that is, up to a critical speed, a sampling control system is used.

A TYPICAL INSTALLATION OF THE ENGLISH ELECTRIC AUTOMATIC GAUGE CONTROL SYSTEM AT A WORKS IN THE MIDLANDS ROLLING COPPER AND BRASS FOR THE MOTOR-CAR INDUSTRY. THE CONTROL PANEL IS ON THE EXTREME RIGHT OF THE PICTURE.

After an error has been corrected an electronic time delay ensures that the screw-downs do not operate again until the corrected gauge has passed through the flying micrometer. This prevents the system "hunting" for the correct gauge. When the speed is greater than the critical speed the system changes to continuous control under the automatic operation of a relay in the control cubicle. Hence the fastest correction possible is obtained with maximum stability.

The incorrect setting of the flying micrometer, the failure to apply the micrometer to the strip, a break in the strip or the running of the "thick end" through the flying micrometer would all show an artificial gauge error. This would cause incorrect and possibly dangerous operation if the automatic gauge control were allowed to respond. An excess error relay immediately prevents this and manual control is made available to the operator. Manual control is always available whether automatic gauge control is selected or not.

The control cubicle (2 ft. by 2 ft. by 7 ft. 7 in. high) is a dust-proof, sheet steel cabinet which can be mounted anywhere desired in relation to the mill.

Book Reviews

Sintering Symposium, Port Pirie, South Australia, September, 1958. Melbourne, Australia: The Australasian Institute of Mining and Metallurgy, 399, Little Collins Street. 30s. to members; 50s. to non-members (postage extra in each case).

THIS book contains the 13 excellent papers presented at this symposium, together with the discussion that followed and a general summary.

The symposium was interesting in that it considered the sintering of both ferrous and non-ferrous ores. In spite of the obvious differences in the chemistry of the processes involved, the basic problem of drawing air through a suitably prepared bed of fine particles and the combustion of the fuel in the bed is common to both ferrous and non-ferrous sintering. For this reason it is valuable for those concerned with iron-ore sintering to learn how non-ferrous workers handle materials, prepare the feed, and ignite the mix in both experimental investigations and commercial operation.

Of the three papers specifically dealing with iron-ore sintering two are concerned with the problems of sintering the fine-grained Australian ores; the third is a more general review of the influence of fundamental factors on the sintering process.

Guide to the Coalfields, 1960. Edited by R. H. Walkerdine and E. G. Corbin. London: Colliery Guardian Company, Limited, 30 & 31, Furnival Street, E.C.4. 20s.

ALL the usual main features of this well-known "Guide" are retained in the latest edition, but with certain changes in detail. Thus, as a result of reorganization throughout the structure of the National Coal Board, extensive revision has been necessary. An additional section now contains lists of NCB brickworks, briquetting plants, and coke ovens, while the list of personnel at Area group levels in the collieries section has been made more comprehensive and more uniform. In this edition each group of colliery maps is included with the area covered for convenient reference.

Following the usual explanatory notes, the Guide includes the personnel of the National Coal Board, the Ministry of Power, HM Mines Inspectorate, and various divisional boards. Then follows information regarding central rescue stations, the Opencast Executive, and a list of open-cast coal sites operating on January 1, 1960. Other sections cover the Coal Industry Welfare Organization, learned societies and institutions, universities and technical colleges, trade unions of the mining industry, the Federation of Small Mines of Great Britain, the Coal Utilization Council, and the Central Association of Miners' Permanent Relief Societies. Other features include a personal index, mines index, licensed and other mines index, and an index to owners of licensed mines. A buyers' guide is included.

Iron and Steel: Master of Them All. By Richard Miles. Thornaby-on-Tees: Head Wrightson & Company, Limited, Teesdale Ironworks. 59 pp. 10 illustrations. 5s.

THIS is a second edition. The author of this paperback is Mr. Richard Miles, who retired in January this year as chairman of the Head Wrightson group. The first edition of some 3,000 copies was published in 1948 under a pseudonym, but the author feels there is no reason for continued anonymity.

The book was intended partly as a textbook for the company's apprentices and as a guide for its apprentice schoolmasters. It is not surprising that it was found that the book had a wider appeal; it has, in fact, been distributed among schools and technical colleges. In compiling the second edition the author has, of course, made some amendments. A number of figures, especially those referring to costs, have required substantial modification. But the major change has been in the addition of a further chapter on "Careers in the Iron and Steel Industry," while a list of questions, intended to help the heads of apprentice schools to find out whether their students have grasped the subject matter of each chapter, has been added.

Mr. Miles covers a wide field and we find the colloquial style attractive and eminently suitable for the readership for which the book is intended.

Israel Steel Mills

Output of rolled products of the Israel Steel Mills at Acre (a subsidiary of the Koor holding company) in 1959 was 20,000 tons. This year's production is expected to reach 45,000 tons, while an output of 100,000 tons is expected to be achieved by 1963. It has yet to be decided whether the works will use high-grade imported ore or domestic ore, adequate reserves of which exist in the Manara region of Galilee. At present the works is based on domestic scrap and imported pig-iron. The Middle East Tubes Company (another subsidiary of the Koor company in which there is also US participation) produced 16,000 tons of seamless and welded tubes last year.

New Equipment and Products

Welding Reclaims Tractor Parts

FIRST twin-headed automatic welding machine manufactured in this country for rebuilding worn crawler tractor links is now in full production at the works of Bowmaker (Plant), Limited, Willenhall (Staffs). The machine is reclaiming links which give excellent wear life for a small part of the cost of new links. A wider range of components which have an initially high cost and are subject only to wear are also being rebuilt with similar economic advantages.

Development of the new plant is the direct result of collaborative field work between Quasi-Arc, Limited, Bilston (Staffs), manufacturers of the welding equipment, and Bowmaker (Plant), Limited. The track link welding machine is fitted with two separate welding heads permitting simultaneous welding on both "rails" of the track. The two heads also enable welding to progress continuously along complete lengths of track without the need for track dismantling.

Actual welding operations are controlled by photo-electric cells and spotlight units which operate when passing over adjustable templates attached to the machine beds.

This device can be set to "gap" the welding automatically, allowing for varying gaps in a wide range of track links. Quasi-Arc, in collaboration with Bowmaker (Plant), has developed automatic welding machines able to rebuild rollers at about a quarter of the cost and to give over 75 per cent. performance of new rollers. Similar methods have now been applied to track links, rollers, idlers, and a range of components not directly associated with track reclamation.

Automatic Sampling of Iron Ore

THREE sets of equipment for the automatic sampling of iron ore at an Italian steelworks have recently been despatched from Britain by Birtley Engineering, Limited, Birtley (Co. Durham). Each set is to be located on the head-end of a conveyor in the ore-blending plant and is designed to carry out primary and secondary sampling and conveying of reject back to the main stream automatically, producing a final representative sample of easily handled proportions.

Two of the conveyor feeds to be sampled have capacities of 400 ton/hr., while a third is of 200 ton/hr. It is believed that this will be the most up-to-date iron-ore sampling installation in Europe.

In Fig. 1 is shown a number of typical light and medium Birtley slotted belt-type samplers employed mainly in secondary or tertiary roles.

But they are also suitable for primary sampling duties in certain types of light capacity plant layout.

FIG. 1.—BIRTLEY SLOTTED BELT-TYPE SAMPLERS FOR IRON ORE.

BTL-14D "Tractoloader"

MANUFACTURED by the Allis-Chalmers Manufacturing Company, USA, the BTL-14D "Tractoloader," a four-wheeled, rubber-tyred loader capable of fast digging, lifting, carrying, and dumping of soils, sand, gravel, coal, shot rock, etc., is now being built in this country by Allis-Chalmers Great Britain, Limited, at its Essendine plant, near Stamford (Lincs).

Power reversing "Tractomatic" transmission with a lever on the steering column to control both forward and reverse movement without stopping the machine to clutch and shift gears is one of the features. Four speeds forward are provided to 22.3 m.p.h. and four reverse speeds to 29.3 m.p.h. Reverse speeds are approximately 30 per cent. faster than the forward speeds in the same gear. This design permits a faster loading cycle without shifting to a higher gear to achieve the same effect. Transmission, coupled with the BTL-14D large single-stage torque converter having a 3 to 1 ratio, assures correct operating speeds for various jobs and conditions.

The transmission also has an automatic clutch cut-off which disengages the clutch when the brakes are applied and at the same time places the transmission in neutral, thereby diverting full engine power to the hydraulic system for faster loading and dumping. As an added safety factor for work on downgrade or when dozing over banks, the clutch cut-off can be disconnected by operation of a lever in the operator's compartment.

A pneumatic coupling provides a flexible, vibration-free connection between the engine flywheel and the torque converter. This coupling retains all the advantages of remote mounts, permitting independent removal of either the engine or transmission for servicing. The loader is equipped with an AEC AV.312 87-h.p. diesel engine and the shipping weight is approximately 14,900 lb.

Various bucket sizes are available for the unit, ranging from 1 to 3 cu. yd. capacity, but the standard bucket size is 1½ cu. yd. The hydraulic oil system is fully enclosed and protected, the oil being triple-filtered by full-flow micronic, magnetic, and wire mesh filters. Maximum dumping clearance under the cutting edge is 8 ft. 3 in.; under the hinge pin it is 10 ft. 5 in. at

maximum dumping height; reach from the front of the tyres to the cutting edge is 2 ft. 10½ in.

Turning radius is 18 ft. 11 in. with the bucket in the carrying position. Four-wheel hydraulic power-boosted brakes are standard equipment.

Main distributor in the UK is Mackay Industrial Equipment, Limited, Central Way, Feltham (Middx).

Flameproof Gate-end Box

LATEST addition to the range of flameproof control gear manufactured by the Belmos Company, Limited, Bellshill (Lanarkshire), is the SGU 30 gate-end box (Fig. 2), which is a smaller version of the SGU 2 gate-end box.

Designed in accordance with National Coal Board recommendations for the control of small motors, it is normally fitted with earth leakage protection, an intrinsically safe earth leakage lockout circuit, and low-voltage control circuit. Two auxiliary side sockets are fitted, including a rotary switch for selecting local/remote and sequence/independent control.

The enclosure comprises a welded steel case divided horizontally into two flameproof compartments, the upper chamber containing a triple-pole reversing isolating switch with a tested breaking capacity of 240 Amp. at 650 V., 0.25 power factor, and through-going busbars, with continuous rating of 300 Amp. The lower chamber contains the contactor and its control and protective equipment which are mounted on a withdrawable chassis for ease of inspection and maintenance. The contacts of the contactor are enclosed by highly efficient arc-chutes which eliminate the need for blow-out coils.

Overload protection is provided by a triple-pole solenoid-operated relay with two-rate dashpots; earth leakage protection is provided by a ring-type core-balance transformer and instantaneous relay which trips at 2.5 Amp. An intrinsically safe lockout circuit is also fitted to ensure that the contactor cannot be closed on an earth fault on the outgoing lines. A warning lamp indicates the presence of a fault. The remote control circuit is certified intrinsically safe. In both the earth leakage lockout and the remote control circuits, the relays are of the plug-in type in sealed moulded cases which provide a safeguard against interference and, in addition, permit removal and replacement without disconnection and reconnection of wiring. The output end can be fitted with either a 30-Amp. bolted plug and socket or a sealing box and gland.

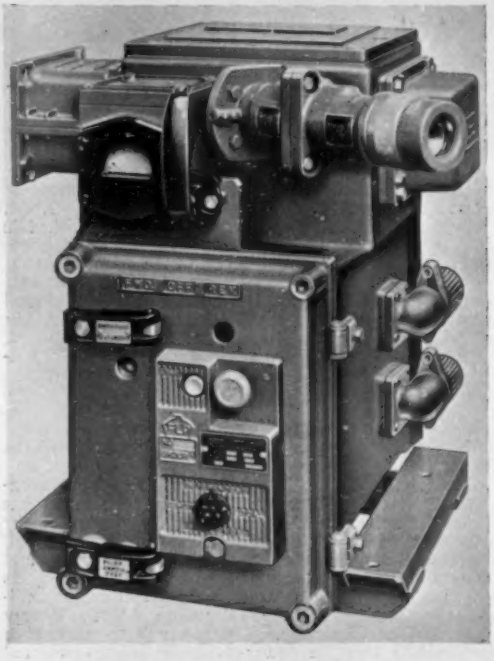


FIG. 2.—THE SGU 30 GATE-END BOX.

Wedge Release Mechanism

A MECHANISM to facilitate the release of wedges used with telescopic friction props has been developed at the National Coal Board's Central Engineering Establishment. As shown in Fig. 1, it consists of a small hydraulic, or pneumatic, ram which can be attached to the prop stirrups by two claw arms, one fixed and the other pivoted. These arms are mounted on a collar which is screwed on to the ram cylinder. The end of the ram plunger

FIG. 1.—FRICTION PROP WEDGE RELEASE MECHANISM.

is serrated to give a firm contact with the prop wedge. A flexible hose, connected to the ram cylinder with a manually operated pump, is long enough to enable the operator to stand at a safe distance while the wedge is being removed to collapse the prop.

Once the mechanism has been fixed in position the plunger releases the wedge when pressure is applied by operation of the pump. A release valve is provided on the pump, and after the roof prop has been released, this valve is released, enabling the plunger to be retracted. The ram is then removed from the prop by removing the locking pin on the pivoted arm. This allows the arms to be removed from the prop stirrups.

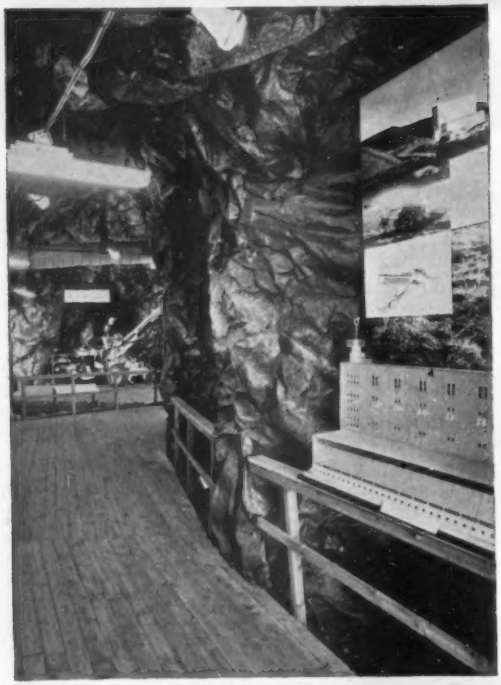
The mechanism may also be used to set wedges and give a constant clamping force to the prop.

Iron-Ore Exhibition Mine in Sweden

LULEA, the ore-exporting town on the coast of the Gulf of Bothnia, is the site of the world's first drive-in exhibition mine, presented by the Swedish mining company, Luossavaara-Kiirunavaara AB (LKAB). It is at Luleå that LKAB will be building its new ore port at a cost of Sw. Cr. 150,000,000. Upon completion, which is scheduled in 1964, the port will be capable of handling shipments of up to 8,000,000 tons of iron ore a year.

The exhibition, which closes on August 7, forms part of the 150th anniversary celebrations of Norrbotten County. Its purpose is to convey some idea of the enormous natural resources, especially of ore, forests, and water power, lying within the boundaries of Norrbotten, which covers about a quarter of Sweden's area.

Every effort has been made to give the drive-in mine every semblance of the real thing. Measuring 59 ft. by 39 ft. by 20 ft., the mine displays lifesize models of a Joy Drillmobil DM2, an Atlas Copco BBC-22 + BMT-50 air leg, a 14-ton truck, and a BBD-46 WS-8 raise climber (Alimak). Visitors are free to drive their cars through the mine or to inspect it leisurely on foot. Models of the new ore port at Luleå, as well as one of the many ore carriers of the Grängesberg Line, are on display.



A VIEW FROM THE "MINE." ON THE RIGHT IS THE WORLD'S LARGEST DRESSING AND HEADFRAME PLANT, SHOWN IN MOCK-UP AND PHOTOGRAPHIC VERSIONS. THE PLANT IS SITUATED AT KIRUNA. THE DRAWING GIVES AN IDEA OF HOW IT WILL LOOK IN THREE YEARS WHEN THE EXPANSION IS COMPLETED.

The adjoining pavilion features a more conventional description in words and pictures of how ore is refined, dressed, and concentrated, of different grades of ore, and with a model ore train locomotive added for good measure. Outside the exhibition area, the Swedish State Railways is displaying its first electric ore train locomotive to run on Norrbotten's ore railroad, together with its latest, the world's most powerful electric locomotive, a Behemoth of 7,500 h.p.

LKAB currently produces 15,000,000 tons of ore each year; by 1965 this figure will be about 20,000,000 tons. It ranks third among the world's iron-ore exporting companies. Norrbotten has at least 3,000,000,000 tons of proved iron-ore resources. Kiirunavaara is the world's largest underground mine. Out of LKAB's 1960 exports, 6,600,000 tons are going to West Germany, 3,900,000 tons to Belgium, and 3,300,000 tons to Great Britain.

What the Iron and Steel Board Does

COMPOSITION and work of the Iron and Steel Board are described in some detail in "The Iron and Steel Board—What it is and What it Does," a booklet published by the board from its offices at Norfolk House, St. James's Square, London, S.W.1. Previously this information has not been published in such a comprehensive form, although, of course, some facets of it have been mentioned in the board's annual reports and special reports on development.

The booklet is designed to assist steel users, steel producers, and other people generally interested in the steel industry to understand the work of the board. It fulfils its aim admirably and is likely to find a resting place on the desks of those people whom it was designed to serve.

Bradford Engineers' Golden Jubilee

To commemorate its golden jubilee, the Davenport Engineering Company, Limited, Bradford, has produced a brochure which relates the history of the company from its humble inception. A converted cottage was then sufficient to house the office and stores. Now, in its jubilee year, the company is engaged in building a large mechanical draught cooling tower for the United Kingdom Atomic Energy Authority at Windscale. The tower is to operate in conjunction with the power-producing plant connected to the new gas reactor. The story between the years makes interesting reading.

Early history of iron powder production in the US dating back some 30 years is recalled by Robert A. Lubker and Kenneth W. Bruland in a paper on "H-Iron Production" presented to the American Institute of Metallurgical Engineers at the recent Blast Furnace, Coke Oven, and Raw Materials Conference. The Alan Wood Steel Company, Conshohocken, Pa., is the second largest producer of iron powder in the country, this product being derived from magnetite deposits worked by the firm. The authors describe the recent development of the H-Iron process based on this raw material. The following is an abridged version of the paper, which was published in the April, 1960, issue of the Journal of Metals.

DEVELOPMENT OF H-IRON PRODUCTION

Process Based on Rich Magnetite Deposits

WITH a capacity of 50 ton/day, equivalent to about 18,000 tons a year, the first commercial H-Iron plant for the production of iron powder is now being operated by the Alan Wood Steel Company, which is the second largest producer of iron powder in the country. This can be easily understood considering the firm operates the Scrub Oaks mine, Denver, New Jersey, working the largest known magnetite deposit in that State. The ore, averaging 28 per cent. Fe, is crushed to $\frac{1}{4}$ in., and magnetite is removed from the gangue by magnetic separators.

This concentrate, containing about 67 per cent. Fe, is used in blast furnaces.

The normal grade of concentrate was found to contain a large proportion of −30 mesh particles almost free of impurities. Removal of these particles by further grinding and gravity separation resulted in a product containing over 71 per cent. Fe.

Excellent Starting Material

This unusually pure source of iron was an excellent starting material for the production of high-quality iron powder. Several methods of reducing iron oxide by carbon and hydrogen were studied.

After careful consideration of various processes, including a high-temperature reduction process developed and piloted in the firm's own laboratories, the H-Iron process was selected. It was developed by Hydrocarbon Research Inc. in cooperation with the Bethlehem Steel Company, and it uses a fluid bed to reduce iron-oxide particles to iron powder.

The success of the H-Iron process depends upon several factors including an economical source of high purity hydrogen; ability to transport particles by a gaseous medium from one container to another, and reduction of iron oxide at sufficiently high pressure and low temperature so that sintering of the particles to each other or to the container is avoided. Iron oxide is reduced with hydrogen in a fluid bed at a temperature less than 1,000 deg. F. and at a pressure of approximately 500 lb./sq. in. The high operating pressure, which is the principal departure from other fluidizing processes, permits a high rate of reduction at low temperatures.

The Alan Wood iron powder plant is composed of four interrelated sections:—(1) Iron ores are prepared for reduction in a raw materials preparation section; (2) hydrogen, the reducing agent, is processed from coke-oven gas and oxygen in the hydrogen production unit; (3) the ore and hydrogen are chemically reacted in the H-Iron reduction section (Fig. 1) to produce metallic iron; and (4) the metallic iron is further processed in the finishing plant.

The reduction section removes oxygen from the ore to produce metallic iron, but unlike the blast furnace, the reducer does not eliminate gangue

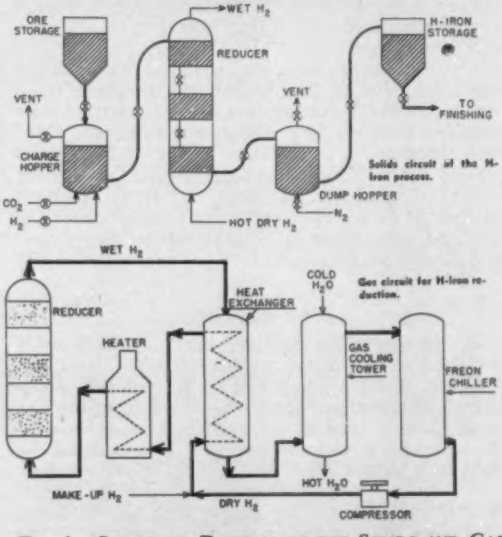


FIG. 1.—SCHEMATIC DIAGRAM OF THE SOLIDS AND GAS CIRCUITS OF THE H-IRON REDUCTION PLANT.

or waste material from the ore. Therefore, to produce metallurgical-grade iron powder, the ore must be free or nearly free of materials other than iron oxide.

Preparation of Raw Materials

Two sources of iron oxide are being utilized at the present time: high-grade magnetite and mill scale from rolling-mill operations, the preparation of the raw materials being performed in two widely separated plants.

At the Scrub Oaks mine, the high-grade magnetite concentrate containing 99 per cent. Fe_3O_4 is dried in a rotary dryer, loaded in covered hopper cars, sent to the iron powder plant at Conshohocken, and transferred to storage

Equipment has also been installed at the Conshohocken plant for the preparation of mill scale or other ores, and for the re-treatment of the high-grade concentrate, if necessary. The raw materials received are dried in a rotary drier, magnetically separated to remove waste material, and ground to a predetermined particle size in a ball mill operated in closed circuit with a classifying system. The product from this section is delivered to storage.

Typical size distribution of concentrates is essentially between 20 mesh and 200 mesh and that of mill scale −80 mesh.

Fluidized-bed Reduction

Iron ores relatively free of inert materials and ground to the desired particle size are delivered from the raw materials preparation section to a 95-ft. high, 5½-ft. dia. H-Iron reduction tower, where the ore is treated in a semi-batch process having three fluidized beds. In the reduction vessel the ore is countercurrently contacted with hydrogen at a temperature of less than 530 deg. C. and at a pressure of approximately 500 lb./sq. in.

Three reducer beds are required for efficient operation, due to the decline in the rate of conversion as the reduction proceeds. The total time required to reach 98 per cent. reduction is divided into three equal intervals of about 4½ hr., representing the residence time for the material on each bed of the reducer. Elapsed bed times are such that about 47 per cent. reduction takes place on the first bed, proceeding to 87 per cent. on the second, and finally to the desired 98 + per cent. on the third bed.

Flow of Solids

In the reduction section, the process flow is divided into two interdependent circuits. Iron ore, sufficient to fill a single bed in the reducer, is delivered to a charge hopper valved off from the ore supply and purged of air by CO_2, a by-product of the hydrogen production section. After purging, the hopper is valved off from the CO_2 and then pressured by a slipstream from the hydrogen circuit. When the pressure in the hopper is about 150 lb./sq. in. higher than in the reducer, the material in the hopper is delivered through a 1½-in. pipe to the top bed of the reducer by merely opening a valve in the line which transfers 15 tons in about 10 min.

Before the reducer can receive a batch of ore from the charge hopper, the iron at the desired degree of reduction on the bottom bed is delivered by pipeline to the dump hopper. The partly reduced material on the second bed is then discharged through internal valves to the bottom bed and the least reduced material on the top bed is likewise dumped to the second bed. The batch of ore in the charge hopper is then transferred to the top bed of the reducer. The charge hopper is later valved off from the reducer, depressurized, and is ready for another cycle. During the transfers, the reduction vessel remains at full pressure, with fluidization and the flow of hydrogen through the reducer uninterrupted.

The dump hopper containing the reduced iron is depressurized and purged of hydrogen with nitrogen, a by-product of the oxygen plant. The H-Iron is then conveyed by pipeline to a storage bin and maintained in the nitrogen atmosphere until it is ready for final processing in the finishing section. Storage under nitrogen is necessary at this point, since the H-Iron is pyrophoric and must not be exposed to air.

Iron Powder Finishing Plant

The additional processing necessary to produce metallurgical grades of iron powder is performed in the finishing section of the plant. The product from the H-Iron reduction section, kept in a nitrogen atmosphere to prevent immediate reoxidation by air, need only be raised to a temperature of from about 820 to 870 deg. C., in order to render it non-pyrophoric.

To accomplish this passivation phase, the H-Iron is loaded in pans and thence into a roller hearth furnace, heated to the desired temperature, and finally cooled to room temperature, in a water-cooled zone of the furnace, the whole of the operation being performed in a non-oxidizing atmosphere.

The stabilized product emerging from the furnace is then treated to produce iron powders for various applications.

Present and Future Consumption

Iron powder has a variety of uses, but the larger tonnages presently go into the manufacturer of moulded mechanical and structural parts, welded rod coatings, metallic-type friction materials, electrical cores and magnets, and into powder cutting and scarfing applications.

In briquette form it will be marketed for use in open-hearth, electric, and induction furnaces. A special grade of melting stock is being developed for vacuum melting, and it is intended to determine the practicability of utilizing partially reduced H-Iron for replacing purchased scrap and ore in the open-hearth, and the H-Iron process in conjunction with electric furnaces for the future expansion of steelmaking capacity.

Company News

MERGER AGREEMENT

Allied Ironfounders and Bilston Foundries

DIRECTORS of Allied Ironfounders, Limited, and Bilston Foundries, Limited, Bilston (Staffs), jointly announce that the terms for a merger between the two companies have been agreed. Under the terms, Allied Ironfounders will acquire the shares of Bilston Foundries on the basis of two Allied £1 ordinary shares for every 15 Bilston 2s. shares. Allied Ironfounders shares closed at 66s. 3d. last Friday before the merger was announced, giving the deal a value of 8s. 10d. per Bilston share, against the Birmingham quote of 6s. 3d.

Full acceptance by the holders of the Bilston £420,000 one-class capital would involve the issue of 560,000 shares. The offer is conditional upon a minimum acceptance of 90 per cent. of the shares.

The directors of Bilston state that results for the year ended March 31, 1960, will be announced shortly. The results have been adversely affected by the running-in experience of the new foundry and the directors will not recommend the payment of any final dividend in respect of that year. An unchanged interim has already been paid. A final of 10 per cent. was paid for 1958-59.

CHUBB & SON, LIMITED—Arrangements have been made for the subscription of 300,000 new 6½ per cent. cumulative preference shares of £1 each.

PIRELLI-GENERAL CABLE WORKS, LIMITED—Net profit fell from £509,764 to £204,404 in the year ended March 31, 1960, and the dividend is reduced to 10 (15) per cent.

RHEOSTATIC COMPANY, LIMITED—A merger has been proposed by Elliott-Automation, Limited, which intends to make an offer for the £150,000 preference and £985,600 ordinary capital.

PRINCE OF WALES DRY DOCK COMPANY, SWANSEA, LIMITED—No dividend is to be paid for the year to April 30, 1960, against 5 per cent. previously. Group trading profit is £51,981 (£65,457).

SHEEPBRIDGE ENGINEERING, LIMITED—Final dividend of 10 per cent. makes 15 per cent. for the year ended March 31, 1960, compared with the equivalent of 12 per cent. Group net profit rose from £409,973 to £562,254, after tax of £467,284 (£390,406).

EFCO, LIMITED (formerly the Electric Furnace Company, Limited)—Final dividend of 15 (12½) per cent. makes 20 (17½) per cent. for the year ended March 31, 1960. Group net profit was £152,890 (£156,061), after tax of £136,991 (£143,816).

SIEBE, GORMAN & COMPANY, LIMITED—In the formal offer for the ordinary capital by the Fairey Company, Limited, it is disclosed that sales of Siebe, Gorman in the six months to June 30, 1960, rose by 7½ per cent. over the previous year's level.

N. HINGLEY & SONS, LIMITED, ironmasters, chain, cable, and anchor makers, of Dudley (Worcs)—In addition to maintaining the dividend at 12½ per cent. a special dividend of 5 per cent. (nil), not subject to tax, is being paid out of surplus on realization of trade investments.

PRICE-PEARSON REFRACTORIES, LIMITED—The new plant to be built at Brierley Hill has been designed as a self-supporting unit, and will be capable of extension to more than double its initial rated output. It will be equipped to produce refractories of the highest quality.

RIVET, BOLT & NUT COMPANY, LIMITED—The offer by Acton Bolt, Limited (a subsidiary of S. Pearson Industries, Limited) of 60s. per £1 share is considered fair and the directors recommend acceptance. It is Acton's intention to retain RBN in existence as a separate Scottish company.

FISHER'S FOILS, LIMITED—In addition to the maintained dividend of 25 per cent. a special distribution of 12½ per cent., tax free, is to be paid out of profit on the sale of trade investment. Net profit for the year ended April 30, 1960 was £145,331 (£212,435), after tax of £254,560 (£209,117).

BRADLEY FORGE & ENGINEERING COMPANY, LIMITED—The Millwall Slipway section of the company will in future be operated by the parent company. Gregson & Company, Limited. The business will be carried on by the same directors and staff and the change is only brought about by internal reorganization.

THORN ELECTRICAL INDUSTRIES, LIMITED—The dividend for the year ended March 31, 1960, is raised from 20 to 25 per cent. on capital increased by the one-for-three rights issue, compared with a forecast of 20 per cent. Group net profit rose from £979,371 to £1,525,988, after tax of £949,069 (£927,257).

INCLEDON & LAMBERTS, LIMITED, holding company for steel tubes and fittings distributors, of London, W.C.2—The final dividend is raised to 10½d. (9d.) per 5s. share, making 1s. 3d. (1s. 1½d.) total plus capital bonus of 1½d. (nil) per share. A one-for-one scrip issue is to be proposed before the end of the year.

WELLMAN SMITH OWEN ENGINEERING CORPORATION, LIMITED—Record group trading profits were reached in the year ended March 31, 1960. Net profits were £835,399 (£633,471), after tax of £799,279 (£684,860), and the final dividend of 15 per cent. makes 25 per cent., compared with the equivalent of 16 per cent. for 1958-59.

BRITISH OXYGEN COMPANY, LIMITED—Because it is felt that a freer and wider market will result from the adoption of smaller units having a proportionately lower value, the £17,047,166 ordinary stock is to be re-converted into 68,188,664 ordinary shares of 5s. each and the 5,452,834 unissued shares of £1 to be subdivided into 21,811,336 shares of 5s. each.

DRAKES, LIMITED, constructional gas engineers, of Halifax—Payment of an ordinary dividend for the year ended December 31, 1959, is not recommended as the board considers that the cash resources should

be retained in the business at the present time, states the chairman, Mr. John A. Drake. Net profit fell sharply from £9,367 to £2,609, after tax of £280 (£2,301).

CHARRINGTON, GARDNER, LOCKET & COMPANY, LIMITED—The issue of 1,500,000 new ordinary 5s. shares at 7s. 6d. per share has been taken up by 98.4 per cent. of holders. For the excess 23,512 shares, applications were received for 331,031 shares and allotments have, therefore, had to be heavily curtailed. No applicant will receive an allotment in excess of his provisional allotment.

VOKES, LIMITED, filtration and silencing engineers, of Guildford (Surrey)—A final dividend of 10 per cent. and a bonus of 3 per cent., makes 18½ per cent. for the year to March 31, 1960, compared with a forecast of 12½ per cent., the rate paid for the previous nine months' period, adjusting for the 100 per cent. capitalization. A one-for-five scrip issue of £204,000 new ordinary shares is proposed.

ELECTRICAL COMPONENTS (HOLDINGS), LIMITED—Final dividend of 7½ per cent. makes 11½ per cent. for the year ended March 31, 1960, on the capital increased by 50 per cent. scrip issue and a 30 per cent. rights issue. This compares with an equivalent of 10 per cent. for the previous year and with a forecast of 10 per cent. Net profit was £170,684 (£141,938), after tax of £173,952 (£145,335).

SCOTTISH MACHINE TOOL CORPORATION, LIMITED—Referring to the criticism of the industry for failing to undertake sufficient research and development, Mr. Douglas Sharp, the chairman, states that it is not realized that a great amount of research is carried on in the daily production of machine tools. The changing demands keep the company as fully occupied in this respect as the shortage of skilled staff will allow.

AMALGAMATED ANTHRACITE HOLDINGS, LIMITED, (holding company for British Anthracite, Limited)—Trading profits fell in 1959, but as this was due to adverse circumstances which are unlikely to recur, the directors consider the results satisfactory. In view of the improved trading results for the six months to June 30, 1960, the dividend for 1959 is maintained at 12½ per cent. Net profit for the year was £279,807 (£273,740).

CASTINGS, LIMITED, malleable iron founders, of Walsall—Capital improvements costing £40,000 are in hand and arrangements have been made for financing a further expansion programme. It is hoped that production will begin by May or June next year, states the chairman, Mr. John F. Cooke. Profit for the year ended March 31, 1960, was £118,425 (£51,772), and the dividend is 15 per cent., compared with the 12½ per cent. forecast in February.

DOWTY GROUP, LIMITED—Group net profit rose from £1,078,139 to £1,570,820, after tax of £1,466,043 (£1,088,709), in the year ended March 31, 1960. In view of the extra earnings the directors are raising the final dividend to 5½ per cent. on the capital as increased by the present two-for-three capitalization issue, making a total equivalent of just over 15 per cent. for the year on the old capital, compared with 11½ per cent. for the previous year.

METAL CLOSURES, LIMITED, West Bromwich (Staffs)—The board has agreed to acquire all the issued capital of Ideal Capsules, Limited, in exchange for 583,333 ordinary 5s. shares of Metal Closures. The company is also to increase its holding in a subsidiary, Metal Closures Properties S.A. (Pty), Limited, by the purchase of all the 150,000 5 per cent. £1 preference shares and a further 25,003 £1 ordinary shares in exchange for £12,750 cash and 83,333 ordinary shares of Metal Closures respectively.

Board Changes

METAL BOX COMPANY, LIMITED—Mr. F. W. Rankin has retired from the board.

GEORGE WIMPEY & COMPANY, LIMITED—Mr. E. G. Loudon has retired from the board.

WELLMAN SMITH OWEN ENGINEERING CORPORATION, LIMITED—Mr. W. C. Bell has been appointed a director.

BOWDEN (HOLDINGS), LIMITED—Mr. W. L. Tregoning has retired from the board owing to other commitments.

JOHNSON, MATTHEY & COMPANY, LIMITED—Mr. A. B. Coussmaker has been elected chairman to succeed Mr. G. C. H. Matthey. Mr. Matthey remains a director.

BROCKHOUSE CASTINGS, LIMITED—Mr. W. Brunt has joined the board and Dr. J. Grieve has succeeded him as general manager of the company, a subsidiary of J. Brockhouse & Company, Limited.

FORD MOTOR COMPANY, LIMITED—Mr. Ernest R. Breech, who recently resigned from the chair of the American parent company, has resigned from the UK board. He has done so "to be relieved of certain of his responsibilities."

CLIMAX MOLYBDENUM COMPANY OF EUROPE, LIMITED—Mr. Wallace Macgregor has been appointed president and has been elected vice-president of American Metal Climax, the parent company. He succeeds Mr. Frank Coolbaugh who retired in June.

FEDERATED FOUNDRIES, LIMITED—Mr. H. Paton Millar has been appointed managing director of the subsidiary, Thomas Allan & Sons, Limited. He joined Federated Foundries a year ago, and was previously works manager of the Harton Ironworks Company, Limited.

BURNTISLAND SHIPBUILDING COMPANY, LIMITED—Mr. J. Clark has retired from the board after 40 years' service with the company. He began his career in 1910 with Wood, Skinner & Company, Limited, and was later head buyer with the Northumberland Shipbuilding Company, Limited. He joined the personal staff of the company's managing director in 1920 and became commercial secretary and a director in 1936.

Brown, Lenox Agreement with US Manufacturers

AGREEMENT has been made between the Palmer-Bee Company, of Detroit, USA, and Brown, Lenox & Company, Limited, of Pontypridd (Glam), for the manufacture in the UK of Palmer-Bee heavy duty conveyors and auxiliary equipment for rolling mills. Under the terms of the agreement, Brown, Lenox will manufacture the plant and equipment to the designs and specifications of the Palmer-Bee Company, and carry out the work of installing it.

Brown, Lenox has for many years specialized in the manufacture of heavy duty material handling equipment for industries manufacturing steel and non-ferrous metal. The Palmer-Bee Company is a leading engineering organization in the US whose main activities are the design, manufacture, and erection of material handling conveyor systems and power transmission machinery. It has pioneered the development of heavy duty material handling systems, and auxiliary equipment for the production of steel strip and flat and shaped products.

PRECISION heavy type wire braiding machinery, worth more than £100,000, has been ordered by Russia from B. & F. Carter & Company, Limited, Bolton.

IRON AND STEEL TRADE

SOME idea of the high levels of iron and steel production now being achieved can be gained from the record imports of foreign iron ores. Shipments arriving into the river Tees in July are expected to reach 460,000 tons, the highest ever, and where the total imports for the first six months of 1960 at 1,621,247 tons are well on the way towards establishing a record for the year. Imports of steelmaking scrap are also increasing and although most of this is being shipped by coastwise routes from other parts of the country, a good proportion is coming from the Continent.

Pig-iron

Tonnage of pig-iron going into consumption keeps up well considering holiday stoppages. The comparatively few weak spots in the trade appear to be due to credit restrictions and are mainly in the light castings section.

The improved order-book position in the textile machinery trade has been maintained and is reflected in a better demand for iron, while deliveries to heavy electrical engineers, machine-tool makers, and speciality engineers, are on steady lines. There is also fair movement to jobbing foundries, but few of them are in a position to see very far ahead from the point of view of work in hand.

Ferro-alloys

Most consumers are now taking their annual holidays and the market is therefore expected to remain quiet during the next week or two. The majority of orders being placed are on a "forward delivery" basis. In this connection a fair demand is noted for most items, ferro-silicon being well supported, and moderate attention is shown to ferro-chrome. There is also a good demand for ferro-manganese and silico-manganese.

There are no price changes to record, and interest in ferro-tungsten is somewhat lacking at present.

Semi-finished Steel

Among the outlets for semi-finished steel materials there is a steady pressure for supplies from the wire mills and a bigger tonnage is now being taken up by the forgemasters.

Round steel bars, including the 3-in. grades and upward, are an active section of the trade and there is a steady call for special alloy steels in rounds and hexagons.

Finished Steel

The demand for plates has been the most significant feature of the last few months and, in spite of the modest requirements of the shipyards, the mills are fully engaged on orders, particularly for export goods.

Structural steel figures largely on order-books which would appear well-filled, at least until the end of the year, and although no real shortage has developed as yet, supplies will soon be getting very tight if the demand continues at its present rate.

FIRE in one of the machine shops at the Manchester works of Mitchell, Shackleton & Company, Limited, steelforgers and crankshaft finishers, which broke out on Monday, will cause some delay in the production of the company's smallest class of product. By moving machinery to other parts of the works and with the assistance of its subsidiary at Lincoln the company hopes to get into production again quickly.

Iron-ore Imports

IMPORTS of iron ore and concentrates (except chrome iron ore and roasted iron pyrites) in June, and the totals for the first six months of this year and last, are shown in the table below.

From	Month ended June 30.	Six months ended June 30.	
	1960.	1959.	1960.
	Tons.	Tons.	Tons.
Sierra Leone	70,030	285,605	416,981
Canada	385,811	575,287	891,463
Other Commonwealth countries and Eire	359	8,131	16,570
Sweden	489,726	1,380,784	2,329,120
Norway	30,638	131,100	170,740
France	48,956	228,564	301,258
Portugal	49,101	111,844	194,026
Spain	51,102	264,245	408,584
Algeria	153,580	752,751	1,065,724
French West Africa	—	117,573	—
Tunisia	71,325	275,362	440,040
Morocco (excluding Tangier)	57,575	198,253	438,766
Liberia	9,220	177,513	250,606
Venezuela	119,946	631,855	829,120
Brazil	55,388	263,874	342,753
Other foreign countries	50,591	78,489	362,386
Total	1,643,348	5,481,230	8,458,137

Steel Stockholders Expand to Meet Demand

ONE of the leading steel stockholders in the country, John Cashmore, Limited, is carrying out a large expansion programme at its Newport (Mon) works to double capacity. New premises are nearing completion which will be specially insulated to maintain an even temperature and prevent condensation.

The company—one of the four accredited stockholders of the Steel Company of Wales, Limited—receives the sheet metal from manufacturers in coils and it has installed a decoiling plant capable of handling all mill sizes of sheet up to 72 in. wide. In order to satisfy the present intense demand, Cashmore is importing steel from Canada. The largest cargo to date—some 5,000 tons of coiled steel—arrived at Newport Docks this week. It is believed to be the largest ever imported into the country by a steel stockholder.

PRODUCTION PLANT of the self-locking division of Whitehouse Industries, Limited, a subsidiary of Pollard Bearings, Limited, is to be transferred from Ferrybridge (Yorks) to larger premises at Monkhill (Yorks). The removal of the 200 machines began on Saturday and is continuing throughout the works' holiday period.

Coalfield News

BERWICK MINER, Mr. Peter Rutherford, is claiming the title "King of the Yetholm Gipsies." He claims that the last Gipsy King, crowned in 1898, was his great grand uncle.

DURHAM DIVISIONAL COAL BOARD'S "Greater Safety" campaign is now in its fourth quarter. The 51 major prizes offered for the current quarter of the scheme consist of vouchers each for domestic goods to the value of £30.

YORKSHIRE AREA COUNCIL of the National Association of Colliery Overmen, Deputies, and Shotfirers is recommending to branches that the former NCB marketing department at Barnsley should be purchased for use as its Area headquarters.

THE INQUEST ON the 45 miners killed in the explosion at the Arrael Griffin Colliery, Six Bells, Abertillery on June 28, has been adjourned until September 21—"in view of the pending public inquiry." The Six Bells Colliery Disaster Fund had reached a total of £56,486 by Wednesday night.

FINAL of the North Staffordshire Area mine rescue competition held on Saturday was won by Hanley Deep Pit with 321½ points out of possible 400. Parkhall Colliery was second with 314 points and Holditch Colliery third with 296. Hanley will now go forward to the divisional final at Birmingham University later in the year.

OPEN VERDICT was returned by the jury at an inquest at Nottingham on Mr. Keith Ernest Lowe (20), who died after an accident at Gedling Colliery (Notts). A member of a working party which was dismantling a coal-washing machine, he was trapped under a steel girder which fell from a wagon he was helping to unload.

TOTAL OUTPUT in the West Midlands Division of the National Coal Board in the five weeks ended July 2 was 1,319,744 tons, a drop of 13.6 per cent. on the corresponding period of 1959. During the June period output per manshift was 90 cwt. at the coal face and 28 cwt. overall. Stocks at 3,058,000 tons were 91,000 tons up on the previous month.

UNDERGROUND WORKER at Firbeck Colliery (Notts), Mr. George Snell, who is a part-time sub-officer in Nottinghamshire Fire Brigade, has been commended for his bravery in preventing a petrol tanker exploding recently. The tanker, loaded with thousands of gallons of high octane fuel, burst into flames after a collision with a motor cycle. Mr. Snell climbed on top of the vehicle and extinguished the fire.

Engineering Output Continues to Rise

PRODUCTION in the engineering and electrical industries in May was 10 per cent. more than a year earlier. Allowing for the Whitsun holiday, which fell in May last year, the figure is substantially less than the increase of 13 per cent. in the first four months of 1960—partly because engineering output was expanding vigorously in the second quarter of last year.

New orders for engineering and electrical goods continued to flow in at a high rate in May. Orders on hand, mainly for capital goods, increased still further, despite the fact that they grew rapidly in the first four months of the year.

BIRMINGHAM OFFICE of Allen West & Company, Limited, has transferred to Pearl Assurance House, Temple Row, Birmingham, 2. The telephone number—Birmingham Central 7831—remains unchanged.

Consumption of Coal Increases

CONSUMPTION of coal so far this year, at 111,495,000 tons, is over 2,500,000 tons more than in the corresponding period of 1959. The only consumers taking less coal this year are the railways, the gas industry, and certain of the engineering industries. Exports continue well ahead of last year's figure. In the 28 weeks ended July 16, 2,761,000 tons of coal was exported, compared with 1,666,000 tons in 1959.

There were 596,500 wage-earners on colliery books on July 16, against 658,000 on July 18, 1959, the numbers engaged at the coal face being 227,600 and 265,300 respectively. Total absenteeism (all workers) in the week ended July 16 was 15.14 per cent. compared with 15.23 per cent. in the week ended July 18, 1959. Output at the face was 4.093 tons and overall 1,408 in the week ended July 16, compared with 3,836 and 1,352 tons in the week ended July 18.

The following table gives (in tons) the output of saleable mined coal by division in the week ended July 23, and the tonnage lost through all causes (holidays, disputes, and go-slows):—

Division.	Week ended July 23, 1960.		Week ended July 25, 1959.
	Total output.	Tonnage lost.	Total output.
Scottish	86,400	277,400	95,900
Northern (N&C) ..	166,300	85,000	199,700
Durham	344,800	121,600	333,200
North-Eastern ..	699,500	119,200	724,500
North-Western ..	213,200	29,500	224,000
East Midlands ..	637,100	254,500	678,900
West Midlands ..	264,600	500	306,400
South-Western ..	241,700	150,800	294,100
South-Eastern ..	26,900	—	27,400
Great Britain—			
Deep-mined coal ..	2,680,500	1,038,500	2,884,100
Other deep-mined (including licensed mines) ..	36,600	—	43,900
Open-cast coal ..	154,500	—	201,700
TOTAL	2,871,600	1,038,500	3,129,700

COALFIELD "SUSPICIONS" OF CLEAN AIR CAMPAIGN

THERE is deep suspicion about the clean air campaign in an area where coal mining is the main industry and where proposals are made which may reduce the use of coal, says Dr. J. M. Watt, Medical Officer of Health for Maltby, near Rotherham, in his annual report. He says: "The clean air campaign might be more successful if the other means of domestic heating were smokeless fuel, and gas and electricity produced from coal.

"Unfortunately the new gas production plant at an adjoining district utilizes oil, and it is well known that certain power stations are also using oil." He adds that to make matters worse, no satisfactory agreement has been reached between the NCB and miners regarding compensation for the loss of concessionary coal.

OVER £150,000 worth of diesel-engined truck chassis and buses comprise three contracts placed with Leyland Motors, Limited, by concerns in Pakistan.

THE COAL TRADE

DESPITE the holiday season, which has been reflected in the normal slowing down in trade, sales on the domestic side this summer are running somewhat higher than last year, helped by the wet weather of recent weeks. Demand for best anthracite is well up to availability, after the winter scarcity. The demand for coke, while weak, is expected to rise as soon as the holiday period is over to beat the higher winter prices. Sales of industrial cokes have been better than last year, and all grades of industrial coal are available without difficulty.

SCOTLAND

Glasgow—Trade continues at a very low ebb, the bulk of industry over a wide area being at a standstill for the annual holidays and many pits are also closed. Only small tonnage is on the move to meet an occasional shortage which cannot be met from stock. The stock position generally is in need of augmentation to bring it up to last year's level. The electricity stations have 454,000 tons on hand compared with 490,000 tons in the same period last year, notwithstanding the fact that more plant will be in commission next winter than last year. Although their needs are likely to be less pressing, gasworks have allowed their stock to drift down to 152,000 tons against 182,000 tons. Railways have 65,000 (70,000) tons in hand.

Coke oven managers have made progress with their task of building up reserves to match the increased throughputs of coking coal and have accumulated 87,000 (61,000) tons. Other grades held at iron and steel works total 40,000 (45,000) tons, while engineering and other metal trades have 26,000 (27,000) tons and other industry 165,000 (175,000) tons.

House coal merchants have taken the opportunity to improve their stock and now have 169,000 tons compared with 147,000 tons. Few of these reserves are adequate to withstand a prolonged spell of severe weather.

Fife and Lothians—Business is again confined to production from the Lothians area, which is back to normal after the recent holidays. Demand for house coal is very restrained, but requirements for local industry are higher than recent weeks. Supplies of all kinds are ample to meet all calls. Export movements are negligible.

SOUTH-WEST LANCASHIRE

Very little interest is being shown in the purchase of house coals and all qualities are readily available. Merchants are putting quite a considerable portion of their receipts into stock each week in order to keep wagons clear of demurrage. As a consequence ground stocks at the depots are now beginning to grow steadily.

There is no change in the gas coke market which continues to be exceptionally quiet with a very meagre demand for central heating and domestic uses. Industrial demand for all steam raising fuels continues to be satisfactory and supplies are coming forward promptly by road and rail. There has been very little stocking of coke at the works.

Coastwise trade from the Merseyside docks is still extremely quiet apart from some activity in the domestic fuel sector for Northern Ireland.

The following are the average prices (per ton) of house coals:—Group 1, 182s. 8d.; Group 2, 163s. 3d.; Group 3, 146s. 5d.; Group 4, 134s. 8d.; Group 5, 121s. 7d.; Group 6, 111s. 5d.; Group 7, 97s.

Coal Chartering

VERY little movement is reported from any of the coal markets and even from Hampton Roads to Japan the volume of tonnage recently fixed has been on a very reduced scale. Interest is, however, maintained on Japanese account and 9,500 tons for the second half of August has been fixed from the Roads to Osaka at $8.20. Tonnage has also been fixed for August loading from Hampton Roads to the Lower Plate on the basis of $6.00 for 9,500 tons to Buenos Aires, and there are other possibilities available. Mobile/Santos paid a similar rate also for 9,500 tons for August 1/15 shipment.

Gdynia or Gdansk to West Italy has taken a 10,000-tonner for prompt shipment at 23s. and there are inquiries for any size from September to December from this loading area to the Argentine at about 35s. on usual terms. Some miscellaneous inquiry is noted from the continental ports for Mediterranean destinations. Wales/West Italy reports two 4,000-tonners both at 24s. 3d. for the second half of August and October respectively, with inquiry maintained for both August and September loading. There are also inquiries for small tonnages coastwise from the Bristol Channel area. Petroleum coke has been fixed from US. West Coast to Bell Bay at $6.50 f.i.o. for August 25/September 25 for about 9,500 tons.

£100 Prizes Offered in Miners' Art Competition

ART competition for mineworkers in Northumberland and Cumberland, first started last year, is being organized again this year by the Northumberland and Cumberland Social Welfare Committee. The competition has been extended to include sculpture, and cash prizes to a total value of nearly £100 are offered. It is open to all working in the coal industry in the two counties, including retired and disabled workers, wives, husbands, and children undergoing full-time education. Dependants of a deceased person who was employed in the industry are also eligible.

Details and entrance form (no fee) can be obtained from the Coal Industry Social Welfare Organization, Northern (N & C) Division, 5/6, Saville Place, Newcastle-upon-Tyne, 1. Closing date for entries is September 1, 1960.

DAMAGES OF £625 and costs were awarded at Leeds Assizes to Mr. Harry Whittaker, a moulder, in respect of injuries to a toe sustained when he was employed by the British Thomson-Houston Company, Limited, Rugby.

Increase in John Thompson's Orders

ORDER for the Dungeness atomic power station which has been placed with the Nuclear Power Group, Limited, brings a record in value of work in hand to John Thompson, Limited. The company is a member of the AEI-John Thompson Nuclear Energy Company, Limited, which is, in turn, part of the Nuclear Power Group consortium. Chairman of John Thompson, Sir Edward Thompson, said at the annual meeting on Thursday of last week, that it was very welcome news and although the company's share of the engineering sections of the contract would be only one-sixth as compared with one third for the Berkeley contract, it still meant that on the larger contract the work for the group companies would be about £7,000,000.

This brought the work on hand uninvoiced at the present time to £39,000,000, £10,000,000 more than the corresponding figure at the end of last year and a record for the company.

Including the Dungeness contract, the orders booked showed an increase of 95 per cent. compared with the same period last year. As against this, the output for the first six months of 1960 for the home companies, and for the first five months for the oversea companies, was down by 10 per cent. That only confirmed, Sir Edward said, that much would depend on increases in production in the last six months of the year. "Every effort is being made and production is definitely on the increase and is going on as fast as manpower and materials will allow," he said.

In his report for the year ended March 31, 1960, Sir Edward said that at the end of 1959 orders on hand amounted to over £29,000,000, but in the three months to the end of March that figure had increased to over £31,000,000. The orders actually booked during the six months ended March, 1960, amounted to nearly £20,000,000 and were more than double those for the corresponding six months a year earlier.

Diamond-drilling Record Claimed

DURING a contract for the Geological Survey of Great Britain, the Foraky Boring & Shaft Sinking Company, Limited, has extracted over 1 mile of core from one borehole, and this with the final depth reached are believed to be new diamond-drilling records for the United Kingdom. Using its standard XXII winch the company reached a total depth of 5,532 ft. at the Wilkesley borehole site in Cheshire.

The hole has been drilled using the diamond drilling method from the start and brine saturated muds. It was started with a diameter of 8 in. and completed with one of 3½ in. A similar rig already holds the record for off-shore diamond drilling at 4,457 ft. depth at a point some three miles east of the Scottish mainland.

Most of the equipment used was specially designed by the Foraky organization and manufactured in its own workshops. Similar equipment has already been used for full coring down to depths of over 7,500 ft. on the Continent by Foraky on a number of occasions.

BECAUSE OF THE DIFFICULTY of finding a site in Sheffield for expansion, S. & J. Kitchin, Limited, engineers, has moved to a new £100,000 factory at Chesterfield.

Britain Urged to Join the Common Market

FRESH examination of Britain's objection to joining the European Common Market, with a view to starting negotiations towards attaining full membership of that organization, was urged in a statement issued on Monday by a group of leading industrialists, businessmen, and MPs. The statement argues that time is now running short, with the "Six" speeding up plans for greater unity by advancing by 12 months the fixing of a unified external tariff, as well as by making larger internal tariff cuts.

"This creates a dangerous situation for Britain, both politically and economically," says the group. "There is now little chance that the Free Trade Association of the Outer Seven can pave the way for a wider European agreement. For the Six, their own integration is the first priority and they are unlikely to reach an agreement with the Seven unless the Seven are willing to accept similar aims and principles.

"Trade war in Europe and the absence of organic links between Britain and the Six will certainly be injurious to Commonwealth interests," the group declares. "Indeed, it would seem to be in the Commonwealth's interests that Britain should share in the greater opportunities for prosperity created by a wider European economic area, and the Commonwealth should have direct links with the European market, for the system of imperial preference is insufficient for the needs of most expanding Commonwealth industries."

The statement was originally sponsored by Mr. J. Grimond, the Liberal Party leader, and among businessmen signing the statement were Sir Geoffrey Mander, chairman of Mander Bros., Limited, and Mr. A. G. B. Owen, chairman and managing director of Rubery, Owen & Company, Limited. Many MPs and members of the House of Lords are also signatories.

BIG RISE IN SALES BOOSTS MUREX GROUP PROFITS

INCREASED profits, a rise of 7½ per cent. in the distribution on the £2,200,000 ordinary and a three-for-four scrip issue are announced by Murex, Limited, metallurgists, manufacturers of ferro-alloys, etc., of Rainham (Essex). The final dividend is 12½ per cent., against 10 per cent., plus a bonus of 2½ per cent. (nil) making 22½ per cent. for the year to April 30, 1960, compared with 15 per cent. Group net profit for the year expanded from £334,000 to £707,000 after tax of £639,000 (£296,000).

The demand for the metallurgical products of the company accelerated throughout the year. Sales turnover rose by 40 per cent., representing mainly increases in the volume of products sold, selling prices having remained constant, the directors state. Sales of welding electrodes were fully maintained, though sales of welding equipment were at a slightly lower level.

The trading results of Murex Welding Processes, Limited, were again very satisfactory. Expenditure during the year on capital projects was at about the level of the preceding year and was financed from current resources.

NEW FACTORY to manufacture electronics equipment is now being completed at Glenrothes (Fifeshire) for Hughes International (UK), Limited, a subsidiary of Hughes Aircraft of the US.

"Serious Setback" at New Cotgrave Colliery

CONSTRUCTION work at the new colliery at Cotgrave (Notts) suffered a serious setback when water burst through the walls of a shaft on Saturday. High pressure pumps from Yorkshire and more than 100 men worked in shifts over the weekend trying to keep pace with the flood water. A NCB spokesman said on Sunday that water was entering the sump in No. 1 shaft at the rate of 750 gallons a minute, but it was hoped to hold the water level before it reached the top of the sump which is nearly 300 ft. deep.

"This is a serious setback," Mr. N. R. Smith, general manager of No. 6 Area, East Midlands Divisional Coal Board, commented. "It will delay the start of production, which is planned to begin in 1963."

The rise of water in No. 1 Shaft was finally checked on Monday. A NCB spokesman said: "The water got to within 6 ft. of the top of the sump—since then it has dropped and the emergency is over."

The development of Cotgrave has been beset with water problems. One shaft has been sunk and concrete lined but it was found that the gypsum content of underground water corroded the concrete. It had already been necessary to freeze the earth by a special process before concreting.

Unusual Journey from Newcastle to Keadby

FIRST of a pair of large power transformers, each rated at 180 MVa and manufactured by C. A. Parsons & Company, Limited, was despatched from the company's Heaton Works, Newcastle-upon-Tyne, last week for the Keadby power station (Yorks). The combined weight of load and trailer was 205 tons and a special route had to be taken. Two bridges beyond Bawtry had to be completely rebuilt. At Belton, a small Lincolnshire village, the load was transferred to a rail transformer wagon which had to be specially adapted to carry a unit of this width. The rail journey of only five or six miles was necessary to enable the load to cross a canal at Crowle. Just beyond the canal crossing the load was re-transferred to the road wagon for a haul of only three miles to its final destination.

Holiday Repairs for English Steel

FULL advantage is being taken of the Sheffield holiday fortnight by the English Steel Corporation, Limited, to carry out an extensive maintenance and reconstruction programme. Largest item is the major overhaul of the 7,000-ton press in the company's forge. It will be completely dismantled and is expected to be in operation again in October. The travel wheels of the 150-ton overhead crane in the heavy plate mill are to be re-tyred.

Part of the road laminated section of the spring shop is being transferred from Grimesthorpe to the new extension at Tinsley Park and at the Holme Lane works, three bays of the main file cutting shop are to be re-roofed. In the melting departments of the Grimesthorpe works the Siemens open-hearth furnaces are being rebuilt and extensive repairs are being carried out on the charger crane.

GEC Chairman's Decision to Retire

TOGETHER with the annual report of the General Electric Company, Limited, and an excellently-produced illustrated survey of the past year's work, comes the news that Sir Leslie Gamage, 73-year-old chairman and managing director of GEC for the past three years, is to retire at the end of the year.

SIR LESLIE GAMAGE

Sir Leslie, who relinquishes his executive duties as managing director immediately, succeeded Sir Harry Railing as chairman in 1957 and has devoted his three years in office mainly to the reorganization of the company and the restoration of profitability. In a statement on his retirement Sir Leslie says that the reorganization plan is now finally set though it may take a year or two to come fully into effect. The past year's results indicated that, given reasonable economic conditions, the company could recover its prosperity.

Sir Leslie, the second son of the founder of the famous store, qualified as a solicitor before joining his father's company before the first world war. He served throughout the war with distinction and then joined GEC, first as secretary, then director, general manager, and managing director.

In his annual review, the chairman reports that GEC entered the current year with a good order-book of £138,000,000, compared with £133,000,000 in the previous year. Both years included some £56,000,000 for atomic energy contracts. Without being unduly pessimistic, he is disappointed with the outlook—demand at home could not be expected to be maintained for some consumer products at last year's high level—but by strenuous efforts to cut expenditure and increase sales the group should be able to maintain, if not improve last year's results.

In the year to March 31, 1960, the group achieved a record turnover of £117,000,000, an increase of 8.2 per cent. Total exports by the group and associated companies were £23,618,000 (£23,771,000). The dividend is maintained at 10 per cent.

Fatally Injured in Shaft Fall

VERDICT of Accidental Death was recorded at an Ynysybwl (Glam) inquest last Friday on a Polish shaft sinker, Mr. Wladislar Grin, who fell 120 ft. after ascending a shaft in a bucket at the Lady Windsor Colliery. Mr. Albert Wilhem, foreman, told the coroner that nobody was allowed to go up the shaft before the end of the shift without his permission.

Another worker, Mr. Graham Morgan Wilce, agreed with Mr. D. W. Peter Williams, for Thyssen & Company, Limited, the firm which employed the men, that what Mr. Grin did was "the most stupid and near-suicidal thing any man could do."

Appointments

Holman's New Manager in West Africa

MR. H. S. WARWICK has been appointed manager of the West African branch of Holman Bros., Limited, manufacturers of compressed air equipment, of Camborne (Cornwall). He takes over from Mr. A. Vernon Gallie, who has retired after 25 years' service as manager.

MR. H. S. WARWICK

The company's West African organization has its headquarters at Takoradi, Ghana, and there are also offices, stores, and depots at Accra, and in Nigeria at Apapa, Port Harcourt, and Jos. Mr. Warwick joined Holman's from Ashanti Adowsena Banket Goldfields, Limited, in 1943, and served in the West African branch for five years prior to moving to East Africa. There he assisted in the formation of a new Holman branch with headquarters at Nairobi, and he was its manager until 18 months ago when he was temporarily transferred to Holman Bros. (Pty), Limited, Johannesburg.

Mr. S. H. OLIVER has been appointed manager of the purchasing department of Castrol, Limited, in succession to the late Mr. A. J. Stafford.

Mr. H. L. TAYLOR has been appointed a joint general manager of the Ever Ready Company (Great Britain), Limited. Mr. B. G. PHELVIN has been appointed secretary in place of Mr. Taylor, and Mr. G. L. GRANT assistant secretary.

Mr. NORMAN GIBB, director of Carter-Horseley (Engineers), Limited, is to take up a similar post next month with the parent company, Horseley Bridge & Thomas Piggott, Limited, constructional engineers and ironfounders, Tipton (Staffs).

Mr. S. PARKER has been appointed home sales manager of J. H. Fenner & Company, Limited, conveyor and belt drive manufacturers, etc., of Hull. He joined the company as West Midlands representative in 1950, becoming Midlands regional manager in 1954.

Number of sales management changes have been made in the chemicals division of Newton, Chambers & Company, Limited. Mr. F. R. JAMES has been appointed general sales manager with Mr. V. A. J. WAGSTAFF as his deputy. Mr. D. NEEDHAM has been made commercial manager, Mr. J. A. BURCKHARDT, trade sales manager, and Mr. F. ETCHELLS, consumer sales manager.

West Midlands Divisional Coal Board has appointed Mr. R. TRIGG safety engineer of the North Staffordshire Area. He has been in the industry since 1939. Prior to his appointment as assistant safety engineer in 1956 he was for a number of years colliery training officer at Chatterley-Whitfield Colliery. Two undermanagers appointed for the Area are Mr. J. S. WILCOX, formerly shaft sinking undermanager at Wolstanton Colliery, who has been made undermanager of Florence Colliery and Mr. W. H. RUSTON, who has acted as undermanager at several collieries in the Cannock Chase Area, who has been appointed to Mossfield Colliery.

Mr. H. A. A. WHILE has been appointed general export manager of the United Steel Companies, Limited. He will continue to be responsible for the railways department, but has been succeeded as manager of the London office by Mr. F. A. PLATTS. Mr. While's appointment follows the resignation on medical advice of Mr. E. B. REES as export manager. Mr. Rees will continue to act as consultant on export matters.

Mr. R. BROUGHTON has been appointed chief of the technical sales department of the Pulsometer Engineering Company, Limited, incorporating Joseph Evans & Sons (Wolverhampton), Limited, of Reading and London, designers and manufacturers of pumps and pumping equipment. Mr. Broughton, who was trained with Gwynnes Pumps, Limited, has also served with Sigmund Pumps, Limited, and was manager of the company's project engineering department before joining Pulsometer.

To support expansion in the field of heavy hydraulic and rubber and plastics machinery, Reed Bros. (Engineering), Limited, London, S.E.18, has expanded its sales force. Mr. K. R. BOREHAM and Mr. G. FENTON, both of whom have represented the company for a number of years, become general sales manager and northern area representative, respectively, with Mr. D. W. HODGKISS representing the Midlands area, Mr. J. E. SPELLAR, London and the Home Counties, and Mr. F. G. O'HAGAN, Scotland.

A number of new appointments are announced by the Workington Iron and Steel Company, branch of the United Steel Companies, Limited. Mr. G. POTT, at present works engineer, is to become chief engineer. Mr. W. HUNTER, blast-furnace manager, is appointed ironworks superintendent, with responsibility for ore preparation and blast furnaces. Mr. F. GREENHALGH succeeds Mr. Hunter as blast-furnace manager. Mr J. D. YOUNG, Bessemer manager, becomes assistant steelworks superintendent, and is succeeded by Mr. G. FORSTER, at present Bessemer shift manager.

HALL ENGINEERING TO ACQUIRE PERFECTA MOTOR EQUIPMENTS

DISCUSSIONS concerning a merger between Hall Engineering (Holdings), Limited, and Perfecta Motor Equipments, Limited, have resulted in Hall Engineering making an offer for the £400,000 capital of Perfecta. The purchase consideration is 32s. 6d. cash for each 5s. Perfecta share plus two ordinary Hall Engineering shares for every five Perfecta shares. The directors of Perfecta consider the offer reasonable and fair and recommend shareholders to accept.

Mr. G. W. Doolittle, chairman of Perfecta, points out that on the basis of 17s. 6d. for the Hall shares, the bid is equivalent to 39s. 6d. per Perfecta share, against the net asset figure of 9s. 7d. per share at January 2, 1960.

Profits of Hall Engineering for the first six months of the current financial year, the directors state, are well in excess of those for the same period of last year. They intend to recommend a dividend of not less than 17½ (12½) per cent. for the year. The cash required for the merger is available, they state, and they have no intention of altering the existing management of Perfecta. Before the end of 1960 Hall Engineering is to receive approximately £2,500,000 for the sale of its motor body division to Standard-Triumph International, Limited.

NEWS IN BRIEF

LEAK-PROOF VALVES to be used in the oil tanker terminus at Avonmouth, near Bristol, are to be supplied by Joshua Hindle & Son, Limited, Leeds. The order is worth nearly £100,000 and will occupy the company for the next 12-18 months.

RECORD for unloading steel billets in the UK is claimed by the cargo steamer Evicynthia. Using four 7½-ton electric cranes she discharged last week a cargo of 10,661 tons of bundles of 30-ft. long steel billets at a rate of 227 tons a working hour.

SOLE MANUFACTURING AND SALES RIGHTS in the UK for the Umbra screens of Victor Halstrick K.G. Herne have been obtained by Nortons-Tividale, Limited, designers and manufacturers of coal screening, washing, and breaking plant, etc., of Tipton (Staffs).

ON VISITING the site of the new industrial estate at Irvine (Ayrshire), the chairman (Lord Ednam) and directors of the British Federal Welder & Machine Company, Limited, Dudley (Worcs), decided to double the space taken by the company to 22,000 sq. ft.

VOLUME of total deliveries of scientific and industrial instruments and apparatus in the first quarter of 1960 was 18 per cent. more than in the corresponding period of 1959. This was a larger increase than in any quarter of last year and deliveries for export rose by 19 per cent.

OUTPUT last year of De Wendel et Cie., SA, the French iron and steel producer, comprised 3,680,000 tons of iron ore, 1,970,000 tons of pig-iron, and 2,460,000 tons of processed steel. Turnover, including taxes, came to Frs. 136,365,000,000 which yielded a net profit of Frs. 1,153,000,000.

BY A SPECIAL RESOLUTION passed at an extraordinary general meeting of Dowsett Mineral Recovery, Limited, on June 21 the company is now incorporated under the name of Richard Thomas & Baldwins (Mineral Recovery), Limited. The Board of Directors and the registered office remain unchanged.

CORE of the transatlantic cable to link Canada and the UK is to be manufactured at the Doncaster factory of British Ropes, Limited. One of the biggest contracts handled by the company, the core will weigh 625 tons and span 1,600 nautical miles. It has a guaranteed minimum breaking load of 4½ tons.

SURPRISE "SERVICE BONUS" was paid to the 300 employees of H. J. Barlow & Company, Limited, manufacturers of bright drawn steel, nuts and bolts, etc., of Sheffield, on the eve of the annual holiday. Employees received £1 for each year's service with the company. Five had been with the company for over 40 years and 17 for over 25 years.

GIFT of £250,000 by the Nuffield Foundation is to be used for the development of group services and industrial hygiene services. Details of the scheme have not yet been worked out, but it is likely that clinics will be set up to provide mobile first-aid services and to advise on hazards such as fumes and dust, and to deal with skin diseases and silicosis.

NEGOTIATIONS are under way for the export of up to 20,000,000 tons of iron ore from the Dominican Republic to Japan. The Japanese concern Ashi Kgyo, Tokio, is interested in the Dominican ore which has a 65 per cent. iron content. Recently Explotacion Minera Hatillo, of Dominica, and Ferrostaal, of Essen, signed a contract for the supply of 800,000 tons of top-grade ore.

PURSUING ITS POLICY of buying vacant factories to prevent an unrestricted flow of new industries into the city, Birmingham Corporation is considering the purchase of the factory of Thomas Smith & Sons of Saltley, Limited, dropforgers. The company is transferring its business to new premises at Coleshill and has offered the Saltley works to the corporation for £80,000.

SAFE DRIVING AWARDS were presented on Friday last to 23 drivers of Rubery, Owen & Company, Limited, structural and manufacturing engineers, of Wednesbury (Staffs), by Ald. A. G. B. Owen, the chairman and joint managing director. He presented the company's safety cup to the nut department of the nut and bolt division. The 64 employees of the section thus qualify for a bonus.

COKEMEN IN DURHAM, numbering about 2,000, have been recommended by the Durham Panel of Cokemen's Lodges, an unofficial organization, to give 21 days' notice of intended strike action over wages and conditions. Mr. T. W. Tindale, secretary of the cokemen's section of the National Union of Mineworkers, said that any action by the Durham Panel would be entirely unofficial.

IN VIEW of the heavy commitments of Furnival & Company, Limited, engineers, of Stockport (Ches), in the manufacture of guillotines, a separate company has been formed to manufacture and sell Andantex reduction units. All communications in connection with the units should be addressed to: Andantex, Limited, Andantex House, Tamworth Street, Higher Openshaw, Manchester, 11 (telephone: EASt 1030).

AGREEMENT FOR THE manufacture of Boby water treatment plant in the Benelux countries and the rest of Europe excluding Scandinavia and Italy has been signed between N.V. Bronswerk, Amersfoort, Holland, and William Boby & Company, Limited, water treatment engineers, of Rickmansworth (Herts). The agreement also provides for the British and Dutch firms to collaborate in the design and manufacture of all types of electrodialysis plant.

FIRST BLAST FURNACE of the General Manuel Savio steelworks at San Nicolas on the River Parana about 200 miles from Buenos Aires, Argentina, has been formally inaugurated by President Frondizi. The plant is owned by the Sociedad Mixta Siderurgia Argentina (Somisa), which is largely a State-owned undertaking, and has so far cost $320,000,000. A further outlay of $100,000,000 is expected before the project is finally completed in four to five years' time.

EXPANSION by buying well established engineering businesses and developing new products of its own design is planned by the Birmingham Small Arms Company, Limited, group. This follows the recent sale of the Daimler Company, Limited, to Jaguar Cars, Limited. Part of the money from this transaction will be used, states Mr. Eric Turner, deputy chairman and chief executive of the group, to modernize existing equipment, but the bulk will be used in the scheme.

AFTER CONSULTATIONS with its 40,000 employees the United Steel Companies, Limited, has decided to contract out of the State-graduated pension scheme in respect of all members of both its staff and works pension funds. Both of these funds are contributory and membership is a condition of employment for all adults who have completed the prescribed qualifying period of employment with the company. Another Sheffield firm, Thos. W. Ward, Limited, has also contracted out of the State scheme in respect of its 1,500 staff employees.

SERVICE ORGANIZATION of the Chaseside Engineering

Company, Limited, is to be established at the Blackburn premises of the parent company, British Northrop, Limited, as from Monday. All service matters relating to Lancashire and Yorkshire should be addressed to the service division at Philips Road, Blackburn, Lancashire (telephone—Blackburn 4065). The service department at Ware is being extended to cover Norfolk, Suffolk, Hampshire, Dorset, Wiltshire, Somerset, and Bristol.

PRIZES in the industrial art bursaries competition of the Royal Society of Arts this year total a record £5,375. The competition is open to students attending an art, architectural, or technical college, and to other young designers, who intend to take up industrial designing as a career. The prizes take the form of travelling bursaries in most cases of £150 each. Enquiries regarding the competition should be addressed to the Bursaries Officer, Royal Society of Arts, John Adam Street, Adeplhi, London, W.C.2.

INTERNATIONAL CONFERENCE designed to show management in manufacturing industries the benefits of modern quality control methods will take place at Church House, Westminster, from September 1-3. An annual event of the European Organization for Quality Control, it will be opened by Mr. Frederick Erroll, Minister of State, Board of Trade, supported by Sir Bertram Waring, chairman and managing director of Joseph Lucas, Limited, and deputy chairman of the British Productivity Council. Eleven papers will be presented by specialists from Britain, America, Holland, France, Belgium, and Italy.

RECORD YEAR FOR BROKEN HILL

RECORD profit was made by Broken Hill Proprietary Company, Limited, the Australian iron, steel, and coal producer, in the year ended May 31, 1960, of £A9,404,293, compared with £7,203,889 previously. The profit is after providing £3,850,000 (£3,250,000) for additional cost of plant replacement, higher tax of £6,200,000 (£5,160,000), and a slightly lower depreciation charge of £5,461,694 (£5,490,556).

Appropriation for mining and plant development has been increased from £450,000 to £1,250,000. Of the total profit, £5,333,500 derived from general trading, and £4,070,793 from general investments and subsidiaries. The dividend for the year was raised from 8¼ per cent. to 8¾ per cent. on increased capital.

The company is to introduce to Australia the Austrian Linz-Donawitz steel process which it is to instal in its projected new steel plant. Between 1962 and 1964 four LD plants are to be brought into operation—two for 100 tons and two for 150 tons.

IPA Medal Awards

SILVER medals of the Institution of Production Engineers for the best papers presented to a section or region in 1958-59 by a member and a non-member have been awarded to Mr. S. G. E. Nash and Dr. W. L. Kent, respectively. The J. D. Scaife Silver Medal for the best paper published in the institution's journal has been won by Mr. C. J. Tanner.

Mr. Nash is the head of the materials laboratories of Bristol Aircraft, Limited, and is the immediate past chairman of the Western section and South-Western region of the institution. Dr. Kent is manager of the British Aluminium Company, Limited, Warrington, and Mr. Tanner is the general manager of Solex (Gauges), Limited.

Orders Placed

Australian Contract for Boulton & Paul

NORWICH firm of structural engineers, Boulton & Paul, Limited, has secured its first contract in Australia for an automatic handling plant for structural steelwork valued at £90,000. It has been placed by Johns & Waygood, Limited, structural engineers, of South Melbourne, and comprises mechanized sawing and drilling machines linked by conveyor equipment.

Boulton & Paul recently despatched a similar mechanized steel fabricating plant to Yuba Erectors, of San Francisco, a division of Yuba Consolidated Industries, US, worth £114,000. To increase its output of structural steelwork, the company is installing a mechanized fabricating plant at the London, E.C.1 factory of Moreland, Hayne & Company, Limited, a member of the Boulton & Paul group.

CONTRACT, worth £500,000, has been placed with Holloway Bros. (London), Limited, to build about 120 elongated caissons for foundations at the new Spencer steelworks of Richard Thomas & Baldwins, Limited, at Llanwern (Mon). The caissons have been specially designed to overcome ground movements arising from the use of boom stacker plant for storage of ores, coke, and concentrates.

ANOTHER RUSSIAN CONTRACT for textile machinery, worth about £1,750,000, has been placed with Platt Bros. (Sales), Limited, a subsidiary of Stone Platt Industries, Limited. A large part of the equipment is for a complete worsted spinning plant, which is to be supplied by the associate company, Prince-Smith & Stells, Limited. The contract also covers worsted finishing machinery and units of cotton spinning. Delivery is to start next year.

THE TWELVE APOSTLES, part of the Table Mountain range in South Africa, is to have a tunnel driven through it by the Cementation Company (Africa) (Pty), Limited, a subsidiary of the Cementation Company, Limited, group. The tunnel—6 ft. 6 in. high with an arched roof and the same width—will supply water to the Kloof Nek filtration plant from the Hely Hutchinson and Woodhead reservoirs on Table Mountain. The contract is worth £190,000 and is to be completed in 600 days.

MAJOR PORTION of the plant and equipment for the preheater unit at the Plymstock works of the Associated Portland Cement Company, Limited, is to be supplied by Plowright Bros., Limited, engineers, of London, S.W.7. The unit will increase production by 600 tons a day and the contract was secured in collaboration with Klockner-Humboldt-Deutz. Plowright Bros. has also received the complete contract—including civil engineering and electrical works—for the 250 tons per hour Baum type washery for Maltby Colliery (Yorks).

CLAIM FOR DAMAGES against the National Coal Board by Mr. Robert Charles Darbyshire (38) for personal injuries was dismissed at Leeds Assizes. Mr. Darbyshire claimed he received neck injuries when he was struck by a tub while working as a ripper at Old Roundwood Colliery (Yorks) in August, 1955. Mr. Justice Streatfeild gave judgment for the NCB with costs limited to £25.

R W G

This is the lower half of a gas turbine cylinder for a 2,500 kW gas turbo-alternator now running in a Midland steel works, converting the heat in waste blast-furnace gas into useful work. The provision of economical power is our business; and since we manufacture most of the main equipment for a power station such as boilers, turbines, alternators, condensers, feed heaters, cooling-water strainers, we are well equipped to design and carry through schemes for the efficient utilisation of any fuel.

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Non-ferrous Metals

Tin Market Eases on US Rumour

MORE settled conditions in the Congo and a rise in LME stocks to 5,274 tons, the highest since last January, have turned the copper market in London easier with a consequent lowering of the quotation. Nevertheless, prices are holding up well on both sides of the Atlantic. The market in the US is quiet with the price of 33 cents a pound still applicable to both producers and custom smelters.

Tin, which has been a strong market in London, Singapore, and New York for the past three weeks, has eased off somewhat following the rumour that the US stockpile authorities are thinking of releasing some metal. The US stockpile has been estimated at around 250,000 tons. However, the outlook is still bright. Production is not expanding with the higher price for the metal and, indeed, it is believed that many of the mines in Malaya are drawing on stocks to fulfil their higher quotas.

Demand is still at a high level in all three centres and the New York price is around $1.05 a pound. Indications are that the London price will move towards £830 a ton, the point at which the buffer stock manager can enter the market.

Lead is a quiet market in London and in New York. Supplies are more than adequate and the LME price is having a hard time holding at £70 a ton. The US price is unchanged at 12 cents a pound.

Zinc is also a dull market on both sides of the Atlantic and is likely to remain so throughout the holiday period. The feeling is that no definite price trend will emerge until after the Lead Zinc Study Group meeting in the first half of September. The US price is unaltered at 13 cents a pound.

Official metal prices in London yesterday (Thursday) were:—COPPER, Standard: Prompt £252 10s., forward £247 5s. TIN, Standard: Prompt £815 10s., forward £817. LEAD: Prompt £71 5s., forward £71 15s. ZINC: Prompt £89 7s. 6d., forward £89 5s.

Dust Disease Survey in Small Ironfoundries

SURVEY of pneumoconiosis, the lung disease, among men in the smaller ironfoundries of Britain revealed less severe disease than was expected to be found. But the Council of Ironfoundry Associations, which carried out the survey, adds that the results give no ground for complacency, and will serve to encourage the industry in its efforts to control the dust causing the disease.

The survey covered 44 foundries in Scotland, the Midlands, and north-east and north-west England, and as the result of the examination of 1,437 men, no "significant abnormality" was found in 1,338. Of the 68 others advised to consult doctors, at least 19 have since been examined by Ministry of Pensions and National Insurance pneumoconiosis medical panels, and 10 have been awarded pensions.

THE HEAD OFFICE of Malcolm & Allan (London), Limited, electrical contractor member of the Metal Industries, Limited, group, has been moved to 229, High Street, Acton, London, W.3 (telephone: ACOrn 7811).

AEI Equipment for Australian Rod Mill

ELECTRICAL equipment for the new rod mill of Broken Hill Proprietary Company, Limited, Australia, is to be supplied by the heavy plant division of Associated Electrical Industries, Limited. The mill will be driven by d.c. motors ranging in output from 600 h.p. to 2,500 h.p. and the total power available will be 17,700 h.p. Mercury-arc rectifiers, switchgear, auxiliary drives, and ancillary equipment are included in the order which is worth £700,000.

Most of the equipment will be manufactured in Australia by Australian Electrical Industries (Proprietary), Limited, and the rest at AEI's Rugby and Manchester works.

Two contracts have been placed with the group's switchgear division by the Central Electricity Generating Board. One is the first order placed by the CEGB for 380-kV switchgear. The isolators and earth switches, substation connections, and protective gear are to be used in connection with the board's experimental 380-kV transmission line between High Marnham and Monk Fryston.

The second order, worth £500,000, is for a new switching station at Brinsworth, near Sheffield, which will provide for the new steelworks projects in the area. It includes seven 275-kV lenticular oil circuit-breakers, control and relay panels, and connection materials for the outdoor equipment. The main items of both these contacts will be manufactured in the Willesden and Higher Openshaw works of the division.

John Thompson Expands Interests in India

AGREEMENT signed by John Thompson, Limited, combustion and general engineers, of Wolverhampton, with the Indian Sugar and General Engineering Corporation (ISGEC) will greatly increase the British company's interests in India. It calls principally for the erection at ISGEC's Punjab works of a plate shop capable of carrying out welding to Class 1 specifications.

Thompson will supply £75,000 worth of equipment, while machinery worth over £200,000 will be contributed by the Indian Company. The plant is expected to be in operation early next year.

Thompson describes prospects in India as excellent and says it looks forward to a widening market not only in India but throughout the Far East.

New Developments By Riscom

NEW products introduced by the Rhodesian Iron & Steel Company, Limited, during the year have included fencing standard and droppers, window sections, and 20 lb. rails, and it is hoped to begin production of 30 lb. rails later this year.

Another development expected this year is the bringing into operation of the new blooming mill and soaking pits, No. 3 blast furnace, sinter plant and ancillary equipment, new turbo blowers and turbo alternator. The new sheet mill should be ready for use early in 1961, when production of light plate and black and galvanized sheets will start.

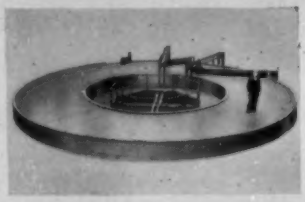
RIGLEY

for all types of colliery surface Installations

A complete service including design, manufacture and installation.

Rotary Sorting Table

This rotary sorting table, which has many unique design advantages, proven in performance, is yet another example of the way our organization is harnessed to the needs of the coal industry. Now incorporated on these machines is our improved driving rack arrangement, side mounted so as to be unaffected by the weight on the table and for ease of maintenance.



Pit Cages

A standard Rigley manufacture.

MILD STEEL TRUNKING IN INTERCHANGEABLE STANDARD SECTION FOR CONTINUING UNDERGROUND VENTILATION AT CROSS ROADS

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Imports and Exports of Iron and Steel

FIGURES of imports and exports of iron and steel in June are given in the following tables, based on Board of Trade returns, and including totals for the first six months of 1959 and 1960.

Total Exports of Iron and Steel

Destination.	Month ended June 30.	Six months ended June 30.	
	1960.	1959.	1960.
	Tons.	Tons.	Tons.
Cyprus	119	774	868
Sierra Leone	761	3,688	2,809
Ghana	1,644	15,455	9,980
Nigeria	5,760	37,814	30,989
Union of South Africa	9,257	23,013	39,903
Rhodesia and Nyasaland	3,912	10,207	13,152
Tanganyika	1,351	8,468	6,356
Kenya	3,750	10,786	15,062
Uganda	73	2,813	683
Mauritius	409	638	2,276
Aden	139	1,307	1,082
Bahrein, Qatar, and Trucial States	768	4,075	8,324
Kuwait	1,091	6,757	4,211
India	24,914	88,526	127,378
Pakistan	4,950	16,292	35,072
Singapore	1,528	11,337	9,638
Malaya	2,262	5,565	10,561
Ceylon	3,948	25,574	30,022
British North Borneo	100	1,502	2,278
Hongkong	13,107	33,934	42,466
Australia	12,069	42,821	83,924
New Zealand	8,965	44,884	50,737
Canada	20,630	76,837	127,410
Jamaica	1,659	10,134	12,811
Trinidad	2,957	20,722	22,450
British Guiana	842	3,018	4,577
Other Commonwealth countries	3,560	19,284	20,051
Eire	4,204	23,516	30,694
Soviet Union	3,511	3,938	16,969
Finland	4,254	16,614	22,855
Sweden	7,836	58,580	94,685
Norway	7,123	45,979	63,472
Denmark	5,835	47,289	50,808
Western Germany	8,391	52,621	78,856
Netherlands	9,970	42,155	66,205
Belgium	3,111	14,504	19,854
France	310	1,194	3,289
Switzerland	982	4,132	6,440
Portugal	1,256	8,447	7,980
Spain	6,193	15,541	26,668
Italy	2,317	25,574	21,423
Austria	422	1,630	2,677
Yugoslavia	1,131	1,717	21,804
Greece	737	5,965	8,231
Turkey	863	3,272	5,911
Netherlands Antilles	168	1,529	2,262
Portuguese East Africa	231	718	2,062
Egypt	104	1,223	6,568
Sudan	395	4,301	5,094
Lebanon	79	1,703	672
Israel	2,037	5,907	11,243
Saudi Arabia	18	2,489	214
Iraq	4,699	47,452	15,184
Iran	6,208	13,391	37,676
Burma	223	4,432	4,071
Thailand	108	4,715	3,154
Indonesia	870	2,548	15,049
China	5,125	25,742	31,171
Japan	5,204	51,571	40,306
Philippine Republic	150	2,328	4,684
USA	7,967	66,917	140,318
Cuba	81	4,122	5,202
Colombia	1,523	1,199	5,166
Venezuela	1,632	39,671	22,871
Ecuador	9	533	1,528
Peru	243	1,388	3,441
Chile	348	821	1,622
Brazil	11,395	7,600	19,855
Uruguay	313	700	4,983
Argentina	6,062	105,328	49,585
Other foreign countries	9,061	34,296	63,086
TOTAL	263,024	1,331,517	1,760,958

Total Imports of Iron and Steel

From	Month ended June 30.	Six months ended June 30.	
	1960.	1959.	1960.
	Tons.	Tons.	Tons.
Union of South Africa	2,953	10,454	19,003
Rhodesia and Nyasaland	806	2,526	3,834
Canada	17,866	8,165	45,543
Other Commonwealth countries and Eire	3,340	5,531	14,810
Soviet Union	3,658	16,833	17,685
Sweden	3,981	13,649	24,004
Norway	13,320	39,973	75,948
Poland	354	2,796	7,917
Western Germany	10,503	27,242	79,168
Netherlands	21,028	89,805	113,922
Belgium	11,407	13,759	61,151
Luxembourg	1,271	3,905	8,027
France	6,321	10,836	35,580
Italy	3,343	4,472	17,077
Austria	1,142	1,832	6,621
Japan	311	1,170	3,448
U.S.A.	86,243	16,257	175,087
Other foreign countries	16,503	5,406	46,913
TOTAL	204,350	274,611	755,738
Iron and steel scrap and waste, fit only for the recovery of metal	6,444	2,002	72,653

Exports of Iron and Steel by Product

Product.	Month ended June 30.	Six months ended June 30.	
	1960.	1959.	1960.
	Tons.	Tons.	Tons.
Pig-iron	8,547	61,484	92,500
Ferro-columbium (niobium)	14	25	74
Ferro-tungsten	18	627	486
Other ferro-alloys	420	2,476	5,661
Ingots, blooms, billets, slabs, sheet bars (incl. tinplate bars), and similar primary forms	972	35,882	20,543
Pieces roughly shaped by forging	70	942	811
Iron bars, rods, angles, shapes, and sections	209	603	851
Steel bars, rods, angles, sections, and shapes	51,458	166,109	326,212
Iron plates and sheets	6	219	415
Universal plates	993	3,808	10,495
Steel plate, 3mm. and under 4.5mm. thickness	4,058	22,127	20,669
Ditto, 4.5mm. or more in thickness	26,422	83,170	175,584
Blacksheets and blackplate	20,777	129,354	153,308
Hoop and strip	8,884	40,241	50,735
Tinplate	35,613	226,650	275,192
Decorated tinplate	467	4,489	2,366
Galvanized sheets	8,730	44,615	42,566
Other (incl. tinned sheets, terneplate, and ternesheets)	1,871	9,798	15,085
Railway and tramway construction material	21,479	80,808	80,967
Wire rods of steel (incl. alloy steel)	2,538	24,000	28,646
Wire	8,583	52,281	63,740
Tubes, pipes, and fittings	60,885	341,809	394,052
TOTAL	263,024	1,331,517	1,760,958

THE COUNCIL of the Institution of Electrical Engineers has recently agreed to the establishment of an annual prize for the best Higher National Certificate student who takes electronics or telecommunications subjects in his final examination. The award, which will be known as the Goldup Prize, has been endowed by Mullard, Limited, as a memorial to the life and work of the late T. E. Goldup a past president of the institution, who took a keen and extremely active interest in electrical engineering education.